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Europe Report

SCIENCE AND TECHNOLOGY

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21 MAY 1986

EUROPE REPORT

SCIENCE AND TECHNOLOGY

WEST EUROPE

EAST EUROPE

/9986

WEST EUROPE/ADVANCED MATERIALS

FRENCH CARBON COMPOSITE FACTORY BEGINS OPERATION

Paris L'USINE NOUVELLE in French 6 Feb 86 p 37

[Article by Pierre Laperrousaz: "Carbone Industrie: 50 Metric Tons a Year by 1990"; first paragraph is L'USINE NOUVELLE introduction]

[Text] This 50/50 subsidiary of SEP [European Propulsion Company] and Alsthom proves the willingness of both partners to make carbon-carbon composites into truly industrial products. Their objective is to cut production time in half.

Built in barely 6 months, the Carbone Industrie factory in Villeurbanne has just put its first three ovens into operation. Together with the other two which will become operational during the first half of the year, the factory expects to produce 25 to 30 metric tons of carbon-carbon composite brake discs in 1986.

This 50/50 subsidiary of SEP and Alsthom is the result of a long collaboration which began 20 years ago between Fibre et Mica--owned by CEM and now called Alsthom--and SEPR [Research Company for Reaction Propulsion], which has since become SEP. The opening of the Villeurbanne factory proves the willingness of both partners to make carbon-carbon composites into truly industrial products. Originally focused on missile nozzles for the strategic forces, the principal market for carbon-carbon composites today is brake discs. Carbon-carbon composites, are more efficient and four times lighter than steel, are used for the Mirage 2000, the Falcon 900 and certain Airbuses. Nearly all Formula 1 stables have adopted them, and the SNCF [French National Railroad Company] is testing them for the TGV [High-Speed Train]. A string of cars carrying a bogie equipped with carbon-carbon brakes should be in use this year. Finally, applications for heavy ground vehicles, both civilian and military, are on the way.

The facilities installed at the Villeurbanne factory, at a cost of Fr 80 million, will enable production of 50 metric tons of carbon-carbon composites per year by 1990. Today the factory employs 50 people, about 10 of them engineers and senior staff.

The production process developed by SEP is based on the impregnation of a carbon substrate using chemical vapor deposition (CVD). The raw material for the substrate is polyacrylnitril fiber (PAN) supplied by Courtaulds or

preoxidized fiber supplied by RK Carbone. These fibers are shaped into preforms which, after thermal treatment and impregnation (or densification), result in the final composite. This composite only requires machining to produce the brake disc.

The entire process is time consuming. Densification alone--i.e., deposition of carbon on the substrate by the decomposition of a gas circulating in the oven--takes several weeks. Overall, 10 months elapse between the first and last process required to produce a disc brake! That is why one of the primary objectives of Carbone Industrie is to cut this time in half over the next 2 years by working on the product management level (reducing dead time) and the process level.

25032/12955
CSO: 3698/A080

BRIEFS

MATRA, NORSK DATA FINANCIAL AGREEMENT--Invitation to invest extended to Norsk Data, agreement with Sun Microsystems ... negotiations are going at a good pace at Matra Datasysteme. The cooperation initiated at the end of 1984 between Matra Datasysteme and the Norwegian firm Norsk Data could well be coupled with a financial agreement soon. In fact, the two partners are said to be negotiating the terms under which Norsk Data would take a minority share in Matra Datasysteme's capital, a share estimated at between 10 percent and 30 percent. This would reinforce the idea of a "scientific data processing pole," which has predominated in the Matra/ND association for more than a year, and which also represents an alternative to Bull's offer (it is well known that Bull has been in the scientific minicomputer market since the agreement signed with the American firm Ridge Computers). [by Philippe Moins] [Excerpt] Paris ZERO UN INFORMATIQUE HEBDO in French 3 Mar 86 p 5] 25036/12955

CSO: 3698/A094

FRENCH OFTA PROMOTING INTEGRATED COMPUTER APPLICATIONS

Paris L'USINE NOUVELLE in French 30 Jan 86 pp 60-61

[Article by Anita Castiel: "A New Breed of Products with Integrated Computers"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Perfect control of constraint parameters in real time is now possible with the help of integrated computers. All sectors are involved and some, such as aeronautics and measurement, have already taken the plunge.

Is a new breed of products in the making? Miniaturization, increased performance, reliability, and the widespread use of data processing systems now permit perfect control in real time of a product's constraint parameters. Consequently, the product no longer has to be divided into subsystems independently researched and optimized, as is usually the case now, a product being a "compromise" between diverse subsystems.

With integrated computers this "compromise" is removed, because the product will continually respond to constraints and transform itself in accordance with the data received. Thus, situations that are supposedly impossible on theoretical or technical grounds are now feasible.

The French Observatory for Advanced Technologies (OFTA) has just highlighted similar achievements at a conference on "generalized design," a more-or-less successful translation of an American expression.

One only needs to turn to the aeronautics industry, a pioneer in this field, to find examples of such achievements. The Mirage 2000 has the distinctive feature of being able to fly in unstable equilibrium. For a long time, such equilibrium existed only on paper. Nevertheless, explained Philippe Poisson-Quinton of ONERA [National Office for Aerospace Studies and Research] and a member of OFTA, "the advantages of instability are important." Reductions in structural weight and in drag, plus an improvement in lift combine to make the Mirage 2000 a "new breed" of plane with greater range and better fuel economy than its predecessors.

Without data processing integrated into the plane, this instability was inconceivable. The integrated data processing system artificially stabilizes the plane at all times. A pilot could not process the superabundance of data

received from the sensors on an ongoing basis. Thus, the on-board computer analyzes the data and "acts" accordingly. For example, the aircraft may reconfigure itself with a modification in the wing camber. It even scorns restrictive piloting instructions (thanks to its automatic protection against loss of control) through programmed limitations on the incidence and rate of roll, as well as against exceeding structural limits.

Fighter planes are not the only aircraft to be tested with this method. The same goes for the future A-320 transport plane. It will be the first aircraft with digital electronic controls offering three primary functions: longitudinal stability control of, load control during maneuvers, and automatic protection against hazardous deviations such as the wind shear near the ground which caused the Dallas accident last year.

In such an aircraft the microelectronic component is vital. No breakdown can be allowed in a system so designed. It is therefore not surprising that "generalized design" made its appearance in the "rich" aeronautics industry some 10 years ago. "Generalized design" should now expand to other sectors as increased reliability and performance and cheaper data processing equipment become standard.

"All sectors are involved", stated OFTA's president Jean-Pierre Bouyssonnie. Automatic control instruments, automobiles, hyper- and nonhyper-complex systems, highly automated production units of all kinds, refineries, rolling mills, paper pulp factories, etc. Some of these sectors have already taken the plunge.

This is the case for the instrumentation industry. In the Renault plant at Cleon, a new gear box control system has been developed using this method by the instrumentation company Metravib Instruments of Lyon. Previously, this control had been one of the most "subjective." In fact, this checking is usually done "by ear". From now on, "an objective measuring device will replace impressions," stressed Pierre Dupuy, who is in charge of the quality control department at Metravib Instruments. Directional measurement of acoustic intensity permits independent analysis of neighboring sources by placing a sensor on each one.

In noisy and often hectic surroundings, as found in most industrial plants, localized measurements are needed. Vibrations from each sensor are transmitted to the computer which in turn compares them to the standard.

Another application is in the paper industry. This industry's key problem is bleaching the paper. This is accomplished through successive chemical treatments lasting approximately 10 hours altogether. The break-even point for the production of "white" pulp is therefore high (approximately 250,000 metric tons per year). Thus factories have to be extremely large and the most recently built factory in France, in Tarascon, alone handles one-fourth of the French forests.

Reorganization of Work Methods Within the Company Is Essential

"This paradoxical situation," stated Claude Foulard, director of the Automation Laboratory of Grenoble (LAG) "stressed the need for smaller yet profitable units." Since 1975 LAG, Framatome, and the Technical Center for the Paper Industry have concentrated on this task. The idea is to use a double-screw extruder and new chemical sequences known on paper, but considered unfeasible because of a too-rapid action. Generalized design makes this possible and shortens pulp treatment from several hours to only minutes! An initial unit will soon be operational.

"These technological achievements now possible cannot be accomplished without in-depth reorganization of work methods within companies," stressed Jacques Melese, consulting engineer and member of OFTA. In effect this method excludes the partitioning prevalent in most companies. Because the product is approached as a system, "cellular organization" is preferred: communications are no longer hierarchical but "tentacular," with each work group communicating with all others, whether they are from technical or marketing divisions. One consequence of such an approach is the nondefinitive character of specifications which are continuously updated during exchanges between work groups.

This drastic change in habits cannot be accomplished overnight. According to Claude Foulard, it takes some 10 years before a company can profitably apply the technology. But after that, "everything goes faster," he stated, and the results are well worth the effort.

25033/12955
CSO: 3698/A074

WEST EUROPE/LASERS, SENSORS, OPTICS

GERMAN MBB DEVELOPS FIBEROPTICS TEST FOR COMPOSITE MATERIALS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
13 Mar 86 p 7

[Article: "Glass Fibers Test Composite Materials--Rapid Materials Testing Possible--Later Also for 'Fly by Light'"]

[Text] The fiberoptic fissure-sensor process, which was developed by Messerschmitt-Boelkow-Blohm 4 years ago, has matured so far, according to the enterprise, that it is suitable for testing of composite materials. Breaks in material can be easily detected if, as a result of the rupture of the workpiece, the built-in or attached glass fibers are also disrupted. Then the current is also disrupted. Following initial use in aircraft construction, the first sets of bogies having composite material frames are to be tested by the German Bundesbahn. Long-term experiments are to be begun during the first half of this year.

Later, the Intercity Experimental (ICE) is to be equipped with fiberoptic sensor systems by Messerschmitt-Boelkow-Blohm. At key locations between longitudinal and cross members of the bogey, where particularly high stresses can occur, fiberoptic conductors have been embedded in the laminate structure. Whereas a year ago glass fiber diameters were one-tenth of a millimeter, today diameters of one three-hundredths of a millimeter are available. These optical threads are bundled together in sets of 30 as light conductor fibers. At predetermined intervals, as well as after the undercarriages of the intercity cars have been operating for a year, a routine testing of the fiberoptics control system will be undertaken and will afford a look into the interior of the MBB-developed composite material component for undercarriages and carrier systems of future train generations, according to the company.

Apart from such passive monitoring devices which are always checked after a specified inspection interval, Messerschmitt-Boelkow-Blohm is also developing a system which can independently and continuously monitor a widely branched network of light conducting fibers, for example, in the fabrication of Airbus components made of carbon fiber composite materials. This would allegedly also facilitate materials control in poorly accessible locations where materials can otherwise only be examined at considerable cost. By appropriately deploying the optical fibers, large-area components can also be monitored. The fiberoptic system also presents the possibility of indicating the status of the structure immediately at the control stand or in the aircraft cockpit. In addition to materials monitoring, Messerschmitt-Boelkow-Blohm is thinking of later controlling aircraft (fly by light) with a similar system.

5911
CSO: 3698/405

BRIEFS

ERICSSON'S OPTICAL SEMICONDUCTOR SWITCH--An optical switch matrix based on semiconductors which can guide light signals is being introduced by the Swedish enterprise LM Ericsson. As the German sister enterprise, Ericsson Information Systems GmbH (Post Office Box 300 229, 4000 Duesseldorf 30), reports, the optical module will facilitate fully optical telephone communications in the future; currently, however, only laboratory versions are available. The switching circuit is alleged to facilitate absolute blocking freedom over the broadband medium of a glass fiber. Thus, data streams of almost unlimited band width, as well as any kind of coding, are said to be switchable. Such components will, however, not become economically interesting until the beginning of the 1990's. The optical switch matrix of 8 x 8 channels will make it possible for optical fiber cable systems to transmit light signals from each of the eight input channels to each of the eight output channels. The laboratory model which has now been introduced unifies the necessary functions on a single lithium-niobium chip. A total of 64 optical couplers are integrated. An internal switching device sees to it that the switched signal remains in the optical domain and does not require an optical/electrical conversion. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 5 Mar 86 p 5] 5911

CSO: 3698/405

WEST EUROPE/METALLURGICAL INDUSTRIES

CMS, DELTASIDER ESTABLISH POWDER METALLURGY PLANT IN ITALY

Milan FONDERIA in Italian Nov/Dec 1985 p 21

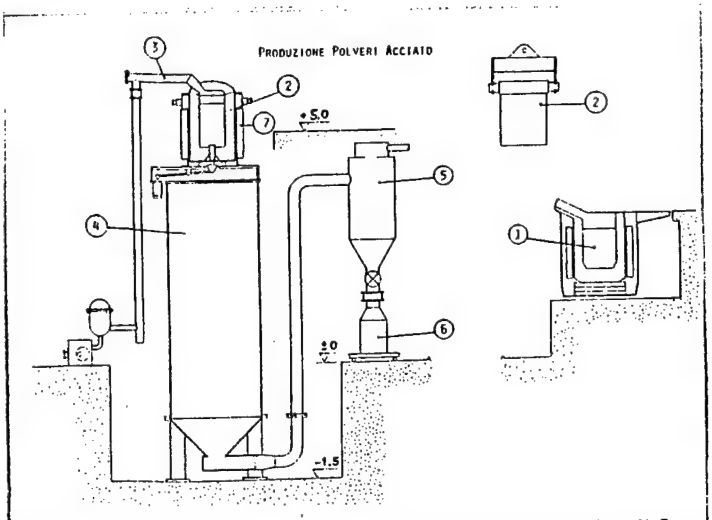
[Text] The Metallurgical Experimental Center (GSM) will work with Italsider on an Aosta plant to produce high-quality powdered steel, using a new process involving spray-injection of the powder into a vertical chamber containing inert gases.

The plant itself will be designed and built by ASEA's metallurgy division and will also incorporate an atomizer-spray nozzle from Osprey Metals, Ltd., to make it feasible to produce pre-cast and drawn-steel billets using quick-set processes.

For efficient control of the bath temperature and the downflow of the steel during the atomization process, CSM will be using an ASEA ladle of revolutionary design, known as Calidus.

Powdered Steel Production Process

(1) Medium-frequency induction furnace
(2) ASEA 'Calidus' ladle
(3) Vacuum de-gassing system
(4) Atomizer-spray chamber
(5) Cyclone chamber for extracting the steel powder
(6) Powder-collection/storage receptacle
(7) Induction coil for Calidus ladle



1) Forno ad induzione a media frequenza; 2) Siviera Asea Calidus; 3) Sistema di degasaggio sottovuoto; 4) Camera di atomizzazione verticale; 5) Ciclone per la separazione della polvere dal gas; 6) Contenitore per la raccolta e lo stoccaggio delle polveri; 7) Bobina induttrice per la siviera Calidus

6182
CSO: 3698/397

FRG INSTITUTES STUDY INTELLIGENT 'ORMOSILE' APPLICATIONS

Hamburg DIE ZEIT in German 7 Mar 86 p 100

[Article by Franz Frisch: "Chips Learn How to Smell: Intelligent Materials from the Retort"]

[Text] Semiconductor elements can "see," can receive and interpret light signals. This has been state-of-the-art technology for quite some time. Soon they may be imitating a different sensory organ: electronic chips will be able to smell various chemicals at the same time, a capability of significance both for environmental protection and for industrial process technology. The material which makes this possible was long regarded as a dream of material researchers: a chemical compound of inorganic and organic substances in one material.

As a result of technological progress over recent decades, chemists have developed on the one hand an incalculable palette of the most varied kinds of synthetic materials, all of which have one thing in common: they consist of organic substances--carbon compounds, which also form the manifold chemical building blocks of living things. With gigantic organic molecules, so-called polymers, almost any given type of molecular structure can be achieved. For this reason, the characteristics of the synthetic materials can be varied in an almost unlimited way.

On the other hand, material researchers have also further developed those materials which have been valued for several thousand years for their stability: glass and ceramics. No wonder that in view of increasingly complex and specialized technical demands it became ever more desirable to create materials which would combine, for example, the stability of inorganic glass with the manifold variable properties of organic synthetics.

Such materials are now possible for the first time as the result of a new process by means of which glasses and ceramics can be produced at significantly reduced temperatures as compared with the traditional melting and sintering processes. By means of this so-called sol-gel process, the various basic materials that are used to create the new material are not first liquified at high temperatures and mixed in a molten mass, as in traditional processes, but rather are immediately rendered into fluid form. This involves either a genuine chemical solution, which changes into a colloidal solution--

in chemical jargon a 'sol'-- or a sol directly. (Colloidal solutions consist of fluids which contain microscopically fine, diffuesed substances.)

The decisive factor is that the different molecules in this sol form polymer structures, which become the basis for the ultimate material. The fluid is gradually consolidated and a gel results. The further reaction for the ultimate material does take place by means of a thermal process, but at relatively low temperatures.

Scientists all over the world are concentrating today on the sol-gel process, as this procedure makes it possible to produce extraordinarily pure and homogeneous glass and ceramic materials with precisely defined crystalline structures. The first, although still purely inorganic, results of the sol-gel researchers are already on the market: the American 3M company, for example, is producing a new abrasive material that lasts almost 10 times as long as previous materials. With the help of the sol-gel process, Mitsubishi in Japan has developed a new material for electronic printed circuit boards. And in the FRG, the Schott company has for years been coating panes of window glass for thermal windows.

When lower manufacturing temperatures are used, glass materials with organic components are also technically feasible. This was discovered by researchers at the Fraunhofer Institute for Silicate Research in Wurzburg. Under the leadership of Prof. Horst Scholze, research in sol-gel processes has been carried out there for the past ten years; the Institute has now attained a leading international position. Years ago, the chemist Helmut Schmidt, together with an interdisciplinary team and almost unnoticed by his professional colleagues, began to develop the so-called "ormosiles," (organic modified silicates). Today there is great interest all over the world in the findings of the Wurzburg research, which has already resulted in about twenty patents.

In the development of ormosiles, Schmidt and his team base their work on two fundamental principles: on the one hand, they introduce organic molecules into the atomic structure of the glass, and on the other hand, in addition to the structure of the glass, they can build up a second, completely organic structure, which is joined to and penetrates the glass by means of carbon atoms.

Because these organic networks can be composed in almost any number of ways, researchers can right at the drawing board construct materials with the desired attributes. The first ormosiles are already ready for production. This includes, for example, a new material for the manufacture of contact lenses for the human eye. Aluminum foils are coated with a second, organically altered silicate, with which glass containers for food products can be sealed gastight at minimal cost: the ormosile on the aluminum foil combines chemically with the glass rim of the container. A different material developed by the Wurzburg researchers allows plexiglass parts to be coated with a scratch-resistance surface.

Because of the great adaptability of the ormosiles, the experts are speaking of "intelligent" materials. Just how effective the new materials are is shown

by "scent-sensitive" electronic systems: the material programmed for this application can be applied to the semiconductor element in a film that is only 10/1000 mm thick.

Organic components in this ormosile not only allow the coating to take place at around 100 degrees Celsius, they also allow for a sensitive quality. They alter their molecular-electronic properties when they come into contact with certain chemicals. And this change can be registered by the electronic system below. Inorganic components, on the other hand, cause the ormosile to adhere firmly to the silicon dioxide of the electronic component. Moreover, by the use of inorganic components, the material can also be made so porous that the sensitive surface of the ormosile layer can be increased a thousand-fold.

Other application possibilities for ormosiles, for example, include use as base materials for catalysts or coatings with defined electrical properties--from semiconductive to nonconductive--in the area of microelectronics. Biotechnology, too, promises to provide a wide range of applications. "Already today," enthuses Helmut Schmidt, "an enormous future demand for such intelligent materials can be recognized."

Because of interest on the part of industry (and also in view of the massive research efforts being carried out abroad), the State of Bavaria is now supporting the development of a focal research area, "New, Non-Metallic Inorganic Materials" at the Fraunhofer Institute in Wurzburg and at the neighboring universities of Erlangen-Nuremberg and Wurzburg. In a five-year research project under Schmidt's leadership, new glass materials, ceramics and ormosiles will continue to be studied and used for industrial applications.

13139
CSO: 3698/403

WEST EUROPE/MICROELECTRONICS

SIEMENS-TOSHIBA CMOS CELL LIBRARY AVAILABLE BY LATE 1986

Duesseldorf HANDELSBLATT in German 17 March 86 p 21

[Text] Siemens AG, Berlin-Munich, has announced further cooperation with Toshiba, the Japanese electronics firm. Together with the Toshiba Corp. Tokyo, Siemens intends to develop an extensive cell library for applications and customer-specific integrated CMOS semiconductor circuits.

The library should be available to customers by the end of 1986. Focal points are standard cells for logical circuits for communications and automated systems, desktop systems and general-purpose computers, as well as for entertainment and motor vehicle electronics.

The term "cell library" describes a collection of functional electronic components or standard cells for logical circuits, which are individually assembled by different users for various purposes. With the joint cell library and the Siemens design system, these customers can themselves design highly integrated circuits (chips) for their specialized applications. They also have rapid access to the entire system via remote data processing.

The joint cell library brings together Siemens design know-how from its Venus design system and Toshiba know-how from CMOS technology, as it is also used in the one megabit DRAM. The cell library encompasses standard cells in 1.5 MYM technology, as gate, register or flip-flop. By 1987/88, the library will be expanded to include more complex macro-cells, and at the same time it will also be available in 1.2 MYM technology.

According to Siemens, underscoring the openness of this cooperation, this joint effort in the area of applications and customer-specific semiconductor circuits could be placed on a broader basis by the inclusion of other partners, especially larger US companies. Siemens is already involved in close cooperation with the Toshiba company for the development of the 1 megabit memory chip. This German-Japanese alliance was established in mid July 1985 with the leading technological position of Toshiba in so-called CMOS memory. Because of this cooperation with Toshiba, Siemens will be able to produce the 1 megabit chip somewhat earlier than had been previously anticipated, according to a recent statement by chairman of the board Karlheinz Kaske.

Last year, the components division of Siemens AG remained relatively unaffected by the marked decline in the market for integrated semiconductor circuits. Although the world market for electronic components as a whole has clearly shrunk, the components division still was able to increase sales to outside parties during fiscal 84/85 (30.9) by 10 percent to DM 2.3 billion. Components valued at approximately DM 800 (compared to 600) million were also delivered to other Siemens divisions. However, the weak world market demand is being felt with 4 percent fewer orders received, at DM 2.5 billion. For the current fiscal year, Kaske believes that in the best of cases electronic components will continue to hold stable, but that most likely a small minus will be registered in orders received and in overall turnover.

13139
CSO: 3698/403

WEST EUROPE/MICROELECTRONICS

BRIEFS

BANK LOAN FOR MEGAPROJECT--Brussels, 25 Mar--The European Investment Bank (EIB) has approved a loan of 200 million guilders to the NV Philips Light Bulb Factories for the so-called megaproject. In this project, Siemens and Philips are cooperating in the development of a new generation of memory chips. The EIB, which finances long-term projects within the EEC, said in a statement that the loan is designated for part of the construction costs of a new computer laboratory. Philips and Siemens hope to be able to bring the new technology on the market in 1988 and begin large-scale production in 1989. [Text] [Rotterdam NRC HANDELSBLAD in Dutch 25 Mar 86 p 3] 12271

CSO: 3698/438

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

R&D SHARE IN FRG, FRANCE, ITALY, UK, JAPAN, U.S. COMPARED

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
14 Mar 86 p 4

[Article: "Research Expenditures of Western Industrial Countries--Industrial Research Is Primarily Being Financed by the Economy"]

[Text] Research and development is the essential prerequisite for the expansion of human knowledge and, more recently, for the expansion of economic development. Whether, and to what extent, research results end up in the production process depends on a multiplicity of factors which will not be explored in detail here. The following presents an overview of the expenditures for research and development--characterized by expenditures and manpower--which are being made in various Western countries. Because of statistical problems, there are some slightly deviating numerical values. However, with respect to their tendency, the indicators provide an overview of the expenditures for research and development.

Table 1. Gross Domestic Expenditures for Research and Development (in millions of ECU)

Country	Total (1)	R&D Personnel (in 000) (2)	Public Funds (3)	Share of Finances of Economy Devoted to R&D (in %) (4)
1. European Community of Ten	53,074	1,098*	28,740	
Including				
1.1. Federal Republic of Germany	18,938	371	8,410	58
1.2. France	12,505	249	8,182	42
1.3. Great Britain	11,618	263	6,814	41
1.4. Italy	4,750	103	2,802	55
Comparison				
2. United States	99,221	2,000**	46,620	50
3. Japan	33,975	680***	10,530	64

* Approximately 500,000 researchers.
** Including 702,000 researchers.
*** Including 406,000 researchers.

Sources to Table 1:

BUNDESFORSCHUNGSBERICHT IV, Bundestag printed matter 10/1543; National Science Foundation United States, "Science and Technology Data Update 1985"; EG Commission, CREST, January 1986, in-house calculation.

Table 1 shows the gross domestic expenditures for research and development, summarized for 1983 which is the last recorded year.

Measured in terms of research expenditures, the European countries are expending about 1.6 times as much as Japan, but only 0.53 percent of the expenditures made by the United States. This ratio in research expenditures is reflected somewhat in the numbers of research personnel. Approximately 1.6 million researchers and engineers are occupied in research and development in Western industrial countries. Added to this is a substantial number of auxiliary personnel, which encompasses at least as many employees. Measured in terms of research expenditures of money as well as personnel, the Federal Republic of Germany lies behind the United States and Japan as the third largest research nation. Within the European Community, it finances 35.7 percent of the research expenditures and contributes roughly in the same amount with respect to research personnel within Europe. The research potential of the Federal Republic is measured by these indicators to be about 1.5 times greater than that of France or Great Britain.

Federal Republic Has a Large Research Potential

However, noteworthy differences exist in the financing of research expenditures among the individual countries of the Western world. The significance of the economy for financing research expenditures is greatest in Japan and in the Federal Republic, followed by Italy and the United States. Countries such as Great Britain finance substantially more than one-half of their research budgets through public funds.

The very different financing of research in the Western industrial countries also becomes visible when one views the public research funds by subject categories (Table 2).

Table 2. Distribution of Public Research Funds by Subject Category in 1983 (in percent)

Country	Defense	Space	Energy	Health	Industry
United States	64.3	5.5	6.6	11.5	0.3
Federal Republic of Germany	9.4	4.3	16.9	4.1	11.0
France	33.2	4.4	7.1	4.3	12.4
Japan	2.4	5.8	12.5	2.6	6.0
Great Britain	50.0	1.9	5.4	1.3	6.5

Source: National Science Foundation, "International Science and Technology Data Update 1985."

The following conclusions can be drawn from the above: In the United States, Great Britain, and in France the share of defense research predominates. Only in the FRG and Japan (the smaller countries were not considered) does defense research occupy a relatively small share in public research expenditures.

This structure must be taken into account in evaluating research expenditures of the individual countries. Defense research is primarily for the needs of the state and not for the needs of the market. A country which expends a whole lot on defense research can, among others, expend relatively less for other scientific areas and for market-oriented research. Perhaps this structure is one of the reasons for the comparatively high degree of competition capability in Japan and in the FRG. The varying structure of research for civilian and military purposes also becomes visible when one regards the share of research expenditures in terms of gross domestic product for the individual countries (Table 3).

Table 3. Share of Research Expenditures in Percent for 1983

Country	Total	Less Defense
United States	2.70	1.92
Japan	2.62	2.57
Federal Republic of Germany	2.59	2.47
France	2.14	1.70
Great Britain	2.27	1.50

Source: Same as for Table 1.

The share of the gross national product expended on research expenditures is frequently considered to be characteristic of the relative research expenditures of the country. Japan and the FRG are about even, both with regard to total expenditures for research and development as a share of the social product as well as when considering purely civilian research and development. Because of the relatively high defense research segment, the expenditures for research and development in Great Britain and France, as well as in the United States, is considerably lower.

Japanese Research Activity Has Increased

If one considers development over the last few years (the numbers are not listed for 1983), one can determine that research and development work has intensified in Japan. More private as well as public funds have been used. In the European Community expenditures in industry are currently increasing more rapidly than those of the state. It is noteworthy that within the European Community the research and development work at institutions of advanced learning is stagnating; a prognosis of future development by individual country, which was recently conducted by the European Community Commission (for source, see Table 1), indicates the following tendencies:

Development tendencies for research and development within the European Community:

Federal Republic of Germany:

a. more indirect support at the expense of direct financing,

b. direct support of areas whose economic situation requires a limited amount of support or which occupy key positions (information technology) or those which are rapidly developing (biotechnology),

c. the science budget is growing more rapidly than the state budget,

d. industry, nuclear fusion, and health are expecting the same expenditures at best, other areas, however, can look for declining public funds.

The Science Budget Is Growing More Rapidly Than the State Budget

France:

a. according to the law of 27 December 1985, scientific research and technologic development are to receive national priority; the targets envisage the increase of the total research expenditures to a 3-percent level of the gross national product by the end of the 1990's;

b. funds and manpower are to be applied on a priority basis by basic research, support of research in enterprises, and strengthened technology transfer for small and medium-size enterprises.

Italy:

a. here, adequate funds are barely planned, with the exception of biotechnology, information technology, and environmental protection,

b. presumably, increased use of public funds to improve the competitive nature of industry.

Great Britain:

a. there are support programs for production technology, for materials technology, for information technology, for telecommunications, and for biotechnology,

b. growing quantities of public funds are planned for improving the competitiveness of industry and for environmental protection; equal or declining public support for agriculture, energy, and medicine.

Generally, it is true for the European Community that, apart from defense and space research, the national priorities for research and development are similar. However, one must consider that industrial research in the essentially industrial countries (OECD countries) is 90 percent concentrated in the five

countries of the United States, Japan, the FRG, France, and Great Britain. This industrial research is primarily financed by the economy. As a rule, the state only gives indirect impetus, but the varying means for supporting projects in defense and space travel of the large industrial countries are considerable and lead to appropriate distortions of research capacities in special economic branches.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH PLAN TO PROMOTE ADVANCED R&D

Paris L'USINE NOUVELLE in French 6 Mar 86 pp 39-40

[Article by Vincent Nouzille: "ETA's Under Magnifying Glass"; first paragraph is L'USINE NOUVELLE introduction]

[Text] In France, 3,000 small and medium-sized industries (PMI's) are reportedly devoted to research and development. The Ragot report makes 10 concrete proposals to promote them through schools, public authorities, and companies.

In the large family of small and medium-sized companies [PME's], everybody is watching with interest two promising young sprouts: the ETA's (advanced technology companies) [as published]. Last July, the minister of industrial redeployment and foreign trade asked Jacques Ragot, president of the Enterprise and Technology Association, to prepare an in-depth analysis of these companies. Ragot, together with the commission which worked on the subject, has just made public his report.

Lacking a precise assessment of the number of ETA's in France (some speak of 3,000), a definition based on three criteria has been suggested. They are small and medium-sized PMI's which devote an important part of their turnover to research and development. They are born and live in new markets by manufacturing unfamiliar goods based on recent scientific discoveries.

In short, they are in full evolution.

With this definition and from observations in the field, the authors elucidate common problems faced by ETA's: undercapitalization, high prices for initial production series, a great need for working capital, difficulties in planning for growth, and a low level of management know-how among their founders. These shortcomings undermine their advantages of high technical competence and creativity.

Jacques Ragot believes that the virtues of the market will constitute the main support for ETA's. He emphasizes that "they are more in need of sales than of assistance." And he makes 10 concrete proposals for advancing them through the influence of schools, local and national agencies, and businesses. The proposals in the commercial and financial areas are the most "provocative."

The authors would like to require national organizations such as the CNES [National Center for Space Studies], CEA [Atomic Energy Commission], CNRS [National Center for Scientific Research], Defense, etc., to give PME's part of their own budget earmarked for subcontracting R&D to third parties. In this case, the report is inspired by the American SBIR (Small Business Innovation and Research) program launched in 1982, which is enjoying great success.

Furthermore, the Ragot commission hopes that, in practice, the French financial system will finally come to regard research and development expenditure as an investment (an asset) and no longer as a working expense. "Intangible assets constitute the ETA's strength. It is necessary to appraise these assets better and to assist their financing," Jacques Ragot says. Finally, the report considers the 1984 law on subscription options to be unsuitable to the companies' trustees and recommends the creation of technology financing companies (SOFITECH). Edith Gresson [minister of foreign trade and tourism] and her associates are not speaking out on all these subjects. The proposals are considered "interesting" and the report "a useful contribution to a new line of thought which remains open." A status report!

25036/12955
CSO: 3698/A094

FRANCE, BELGIUM SHARE EUREKA PROGRAM IN OPTOELECTRONICS

Brussels ATHENA in French Jan 86 pp 32-33

[Article: "France-Wallonia: Projects Within The EUREKA Program"]

[Text] "Wallonia and France have agreed to cooperate on the technological level and to carry out certain joint projects within EUREKA." This was announced by Melchior Wathelet on Wednesday January 8 after a 1-hour conversation with the French Minister of Research and Technology, Hubert Curien. The minister-president of the Walloon Region added: "Execution of such projects within the European EUREKA project is very probable."

At the moment, one of the most detailed projects is that of a French-Spanish-Walloon network using infrared detectors to study metorite paths in the sky.

Installed on the territroy of the three countries, these optoelectronic detectors would make it possible to locate the meteorites that fell to earth and to study this primary material of the solar system. Other applications in celestial and meteorological observation can be expected for such detectors, which would be manufactured by Thomson for France and Etca, Sonaca, Amos, and Britte for Wallonia as part of a project with a budget amounting to about 1.3 billion over three years (16 detection stations would be installed). In addition, a thermal electrical energy production project would be conducted by the Atomic Energy Center, the Stabine consortium, for France and Cockerill Mechanical Industries for the Walloon region. By 1990 the planned machines capable of supplying a power of 100 megawatts with excellent efficiency would be available.

25021/12955
CSO: 3698/A085

WEST EUROPE/TECHNOLOGY TRANSFER

EUROPEAN PARLIAMENT HOSTILE TO AMERICAN EXPORT CONTROLS

Amsterdam COMPUTERWORLD in Dutch 4 Mar 86 p 5

[Article: "European Parliament Criticizes American Technology Policy"]

[Text] Brussels--The European Parliament in Strasbourg profoundly disagrees with the restrictions imposed by the United States Government on the transfer of technology to East European and other communist countries.

The members of the European Parliament think that due to the typical American approach European companies are the primary victims of such measures. The Netherlands Socialist rapporteur Alman Metten stated in Strasbourg that there are already over 10,000 products containing American parts and/or technologies subject to United States control.

Metten also criticized the fact that technological data are subject to export control. One of the consequences of this is that certain important American speakers and research data are unavailable for scientific congresses. Metten further complained that American technology is increasingly difficult for European companies and researchers to obtain.

The European Parliament also blames the government in Washington for unilaterally declaring American law to be valid on European territory. People in Strasbourg are particularly outraged at the continuing grain sales to the Eastern bloc, which puts the United States in a position of direct competition with the European Community on the East European market.

Therefore, the members of the European Parliament would like the European Community to examine whether the restrictions imposed on Europe by Washington are not in contravention of the Treaty of Rome. Moreover, the parliament wants the list of sensitive military items to be revised regularly.

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WEST EUROPE/TECHNOLOGY TRANSFER

EC, FRG, SWEDEN REACT TO COCOM EMBARGO RULES, CONTROLS

EC Critical of U.S. Controls

Stockholm NY TEKNIK in Swedish 6 Mar 86 p 6

[Article by Staffan Dahllof]

[Text] Copenhagen--"American law should not apply in Europe. Make laws of your own that will neutralize the U.S. technology embargo!"

That is what the EC's member countries are being urged to do by the advisory European Parliament.

The Parliament's latest meeting in Strasbourg marked the first time that any official EC institution had taken an open stand against the U.S. embargo policy.

After being shelved for half a year, the controversial resolution was adopted by a unanimous Parliament. Its criticism agrees in all essentials with the committee proposal reported earlier by NY TEKNIK.

The U.S. technology embargo hurts West Europe's economy more than it does East Europe's military strength--and more and more people in the EC are beginning to think that that is its purpose (see NY TEKNIK No 48, 1985).

The embargo on technology for the East is not condemned in its entirety. The agreements reached within the framework of the West's Coordinating Committee (COCOM) are still said to be necessary (see the following article).

But the EC is massively critical of U.S. export rules that place the other COCOM nations in the position of vassals to the United States.

Unity Harmed

The heart of the criticism is that West Europe, which trades heavily with the East, is alone in having to pay the cost of U.S. policy, a circumstance that is harming "Western unity."

The European Parliament is therefore telling the Economic Community's member nations:

"Make laws of your own that will counteract American export rules."

And the Parliament is telling the United States and the EC's top political body, the Council of Ministers:

"Abolish controls over trade in technology among the COCOM countries as well as trade with those countries which have pledged to comply with COCOM's embargo decisions."

And the European Commission, which is responsible for the day-to-day running of the EC, is also being given a recommendation:

"Find out whether COCOM's regulations conflict with the EC's charter (the Treaty of Rome) and, if necessary, let the European Court of Justice consider the embargo policy."

The call for a legal test may indicate the most important path to follow as far as continued EC criticism of the United States is concerned.

In most cases, resolutions by the European Parliament have limited significance, since that body has no decisionmaking power.

Internal Market

But the "reform package," which is the EC's most controversial issue just now and which was the object of the referendum in Denmark, includes proposals on new steps toward a developed "internal market."

Those proposals give the European Court of Justice more leeway to take stands on the various obstacles to trade which the EC says it wants to abolish.

"I can very well imagine that the technology embargo will be considered by the court," says Claus Toksvig, a Conservative Danish member of the Parliament and of the committee that produced the criticism of the embargo.

Bodil Boserup, who is a Socialist member of the same committee, says that the criticism of the United States has aroused a great deal of bad blood behind the scenes at the EC.

She says: "People would prefer not to clash with the U.S. Administration, but the fact that the resolution was nonetheless adopted unanimously gives evidence that technology is in fact being transferred to the East despite U.S. regulations."

COCOM Influence Expanding

Stockholm NY TEKNIK in Swedish 6 Mar 86 pp 16-17

[Article by Mikael Holmstrom; first four paragraphs are NY TEKNIK introduction]

[Excerpts] The government's decision last week to stiffen export controls means that Sweden is plugging the last hole in Europe's technology wall.

That technology wall cuts straight through Europe, just like the Iron Curtain. It is a barrier intended to prevent the East from getting its hands on advanced technology from the West.

It has been built by stiffer export controls in one country after another.

Construction of the wall is coordinated by COCOM in Paris--one of the world's least known international organizations.

Paris--COCOM's goal is to see to it that the Soviet Union and other communist states do not have access to advanced technology. A technology embargo has existed since 1950.

Construction of Europe's technology wall is directed from Paris. Policy is coordinated there and then carried out by the 16 member states on their own. The membership consists of Japan and all the NATO countries except Iceland.

The reason why COCOM is located in an American building is that the United States has long been the driving force behind COCOM. Ever since COCOM was established, it has been surrounded by the strictest secrecy.

It can be said that the more important COCOM has become, the less information has been released to the world. This is especially true today, when COCOM is playing an increasingly important role.

Permanent personnel in Paris number only 20 or so, including COCOM's chairman, who by tradition is an Italian. But a large number of diplomats and experts visit the cramped and shabby building in a steady stream.

At least five different kinds of meetings within COCOM can be distinguished.

1. Revision of Embargo Lists

The export controls of COCOM countries are based on the technology included on various goods control lists. Those lists used to be revised every 3 years, but since 1985 that revision must take place every year--the wall must not be allowed to fall into disrepair.

That is why new groups of experts from the 16 member countries fly in here almost every week. Once they have negotiated the technical requirements, each country is supposed to see to it that the check lists are applied.

One result is that Swedish firms are increasingly being required to fill out import certificates in order to import from COCOM countries. In doing so, they promise to obey the export regulations by not reexporting the goods in question without permission from the COCOM country. The certificates are issued by Swedish chambers of commerce, since Sweden has not had government export controls in the past.

2. Exemptions From Embargo

The embargo is not total, since some technology of a simpler nature can be exported. The condition is that it must not threaten the security of the Western countries. Exemptions in the case of advanced technology require approval in Paris, and decisions are not made by majority vote: the countries must be unanimous. What this means in practice is that each country has veto power over the other 15.

Exemptions are reviewed at a meeting held by the permanent delegates--a group of diplomats--every Tuesday. Sweden does not take part, but Swedish firms often use COCOM technology, usually from the United States. This means that Swedish business is presented most often by the United States.

But an application for exemption must first be scrutinized and approved by the U.S. Department of Commerce. It is then placed at the bottom of the U.S. State Department's list of matters to be taken up with COCOM. The reason is that each country has a quota, and the U.S. quota is about 100 items a week. In all, the United States requests about 4,000 exemptions a year, while the figure for all the other countries combined ranges from 1,000 to 2,000.

In a series entitled "Export Controls," NY TEKNIK described how U.S. approval was obtained for the export to Czechoslovakia of a Swedish telephone exchange manufactured by Ericsson (see NY TEKNIK No 10, 1985). That process also included a detour to COCOM for approval.

What this means is that all of Ericsson's documents are sent to Paris, translated into French, and sent to the other 15 countries (French and English are COCOM's working languages).

Then when a matter is brought up at the Tuesday meeting, the export in question can be approved at once and removed from COCOM's agenda. But in the case of large deals, there is usually a period of about 3 months in which the matter is considered.

A country that is doubtful can register a one-time "reservation" that does not need to be explained. The next step is to raise a "question," and then the matter is automatically postponed until the question has been answered.

We were told in Paris: "And the questions asked are such that they must be telegraphed back to the capitals of the COCOM countries, where they are studied for weeks or months. These are not simple technologies, so it takes time."

A country that is dissatisfied with the answer can impose conditions that are binding on the exporting country. For example, a particular component of the export item may have to be replaced--something the exporting country usually objects to, since the customer in the East does not want to buy a product that will not perform as well.

Negotiations of that kind do not take place around the table at COCOM but between the COCOM countries concerned. The disputes are often concerned with the way in which the embargo lists should be interpreted.

"It is a disadvantage that Sweden is not a member of COCOM. Naturally, each country's interpretation is the one that favors it the most. There can be some very tough struggles, and sometimes words are used that are normally never heard in diplomatic speech," says one of those familiar with the way things are done.

If no agreement is reached, there is the final option of vetoing the export through what is called an "objection," and with that, COCOM halts the export.

Not having its own seat in Paris is, so to speak, the price Sweden pays for its policy of freedom from alliances.

There are few instances where one can clearly show that Sweden has been discriminated against. A current example of possible discrimination is a case in which Ericsson withdrew from the bidding to supply Bulgaria with telephone exchanges after it was told that COCOM would say no. As time went on, the French received an order for the export of telephone exchanges to Bulgaria, but from all indications, that deal has not yet been approved by COCOM.

3. Cooperation by Export Police

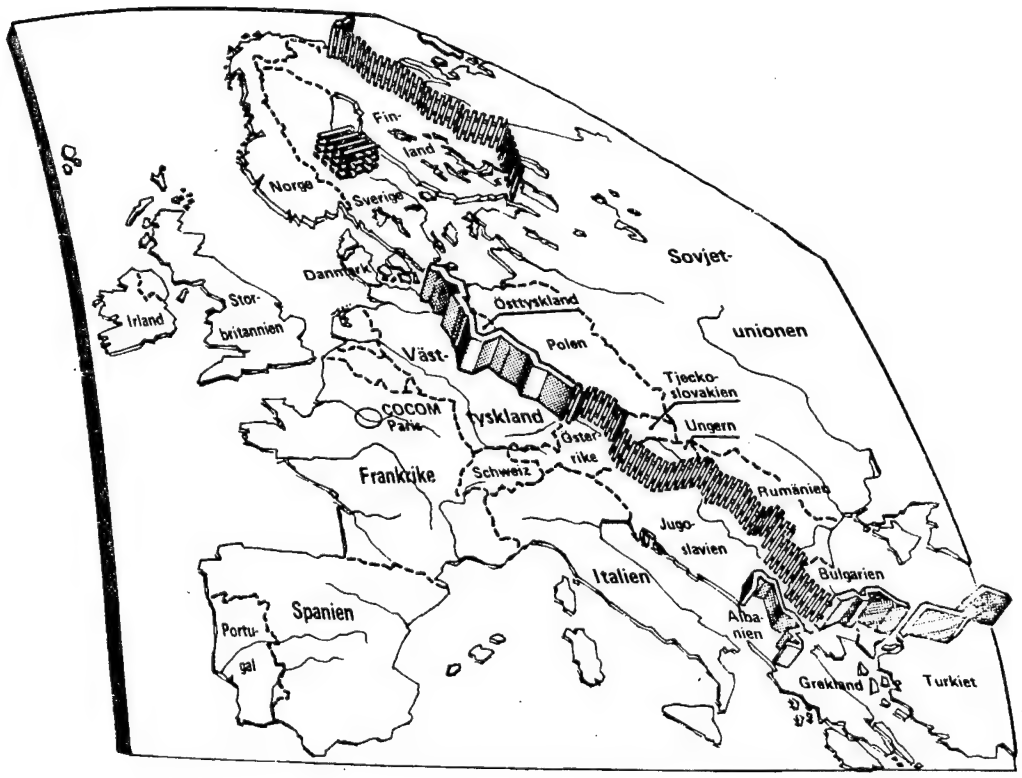
The Subcommittee on Export Controls meets in Paris from time to time. This group brings together the export police from the various countries. They try to make the international hunt for firms and businessmen violating COCOM's embargo more effective. A number of tightened laws, prosecutions, and convictions have yielded results:

"Between 80 and 90 percent of the European businessmen who were participating in technology smuggling to the East a few years ago have now given it up. The risks are too great, and they simply do not dare any longer.

"This is true even of countries outside COCOM, such as Sweden. There was a time when large, well-reputed Swedish firms could slip a few extra embargoed goods into their large shipments as a 'favor' to the Soviet Union. But no one dares do that any longer," says one person who knows the ins and outs of the problems with technology smuggling.

4. Military Evaluations

The U.S. Department of Defense--the Pentagon--has long felt that diplomats and businessmen have too much influence on COCOM's decisions and that the military



The map shows the Western bloc's own "iron curtain" for halting technology trade with the East. COCOM's eastern border is indicated by the wall. The export controls of alliance-free countries follow the line indicated by the fence. Sweden is a gap in the border between East and West, but the materials for a fence have already been assembled. Customs is to set up Swedish controls effective 1 June to see that the export rules of the Western countries are followed.

COCOM countries: Belgium, Denmark, France, Greece, Holland, Italy, Luxembourg, Norway, Portugal, Spain, Great Britain, Turkey, and the FRG, plus, outside Europe: Japan, Canada, and the United States.

Alliance-free countries with export controls: Ireland, Iceland (a member of NATO but not of COCOM), Yugoslavia, Switzerland, and Austria.

Alliance-free without export controls: Sweden until 31 May of this year. After that, the new export controls adopted by the government will be in effect.

Countries under embargo: Albania, Bulgaria, Poland, Romania, the Soviet Union, Czechoslovakia, Hungary, and the GDR. (Outside Europe, COCOM's embargo covers Afghanistan, China, Mongolia, North Korea, and Vietnam.)

have too little. The COCOM countries began discussing the matter in 1982, and a compromise was reached in October 1985.

A committee called STEM (Security and Technology Experts Meetings) was set up. STEM has no formal ties with COCOM, but the same countries participate, and unanimous evaluations by STEM are to be the basis of long-term decisions by COCOM.

As one spokesman for STEM puts it, "there will be a few more facts and a little less nonsense at COCOM meetings."

If STEM works, COCOM will stay ahead of industry by adding production engineering for the technologies of the 1990's to its embargo lists before the products are even ready. So preparations for adding to the technology wall are already being made.

5. Political Coordination

COCOM's overall policy is established at so-called high-level meetings by ministers or deputy ministers. Despite differing opinions, it has been possible in recent years to agree on several important decisions.

The "Farewell" spy affair forced several Western governments to take export controls seriously and contributed to the fact that COCOM now functions as a wall between East and West.

At the same time, there is criticism from industry within the COCOM countries on the grounds that other COCOM countries are letting technology slip through or that countries outside COCOM are making money from the embargo.

The countries outside COCOM have long been influenced by the United States. For example, the Pentagon tries to induce industries in those countries to stop exporting their own technologies if the corresponding technology has been embargoed by COCOM. Under Secretary of State Stephen Bryen at the Pentagon says that Swedish firms ought to be "well informed."

"If a Swedish firm wants to fall in line and not get into difficulties, it must try to abide by the COCOM list," says Stephen Bryen.

COCOM itself does not influence other countries or their firms--that is a job for the individual member countries. It is chiefly the United States which tries to extend Europe's technology wall around the world.

There have been negotiations with a large number of countries in Asia and Southeast Asia. In Europe, export controls are being tightened even in countries outside COCOM. Sweden will also introduce export controls on 1 June of this year (see the last item in this article).

"One cannot avoid the fact that among the COCOM countries, there is a growing feeling that we must either prevail upon the other countries to observe the

embargo or begin cutting them off from COCOM technology," says one well-informed observer in Paris, who adds:

"Disciplining the other countries in the West will probably be the next big task."

FRG Supports U.S. Embargoes

Stockholm NY TEKNIK in Swedish 6 Mar 86 p 19

[Text] Bonn--"All COCOM countries would be pleased if Sweden could track down and punish the smuggling of embargoed goods. This would naturally be a matter of national measures--not measures adopted under pressure from outside." That is the common opinion in West German government circles.

The FRG's export controls, which have been tightened up considerably in recent years, are explained by the country's membership in NATO. Even though the government wants to promote trade between East and West, that cannot take precedence over national security interests.

The FRG differs from Great Britain and France in that it issues not only export permits but also permits for reexports. In that respect, it pursues the same policy as the United States. A Swedish firm that exports West German technology to countries outside COCOM must have a permit.

Unlike the situation in many other countries, a West German firm can appeal to the courts if the country's licensing authorities refuse to grant an export license.

Sweden Closes Last Loophole

Stockholm NY TEKNIK in Swedish 6 Mar 86 p 20

[Article by Mikael Holmstrom]

[Text] Sweden is now closing the last hole in Europe's technology wall. The new regulation adopted by the government last week is tailor-made for catching those who violate other countries' export rules.

Customs will be responsible for seeing to it that the export regulations in effect in COCOM countries are also observed in Sweden.

Certain foreign goods must not be exported from Sweden without a permit from the producing country. That is the basic principle underlying the export controls. What this means in plain language is that starting on 1 June, a violation of another country's export laws will also be a violation of Swedish law.

Violations of Sweden's new regulation will be punishable by fines or imprisonment for up to 6 years under the Goods Smuggling Act.

The new regulation applies to goods covered by export restrictions in the producing country and included on a special Swedish list. The goods on that list are recognizable from the "incidents" that have occurred in recent years.

Included are computers and peripheral equipment, electronic components, and instruments for measurement and control. Also included is the equipment for manufacturing those various items as well as, lastly, computer tapes, disk storage systems, and anything else involving software. The exact extent of what is covered and the formalities involved are to be decided by the Customs Service. That work is not yet complete.

No later than 1 week before goods are to be exported, they must be reported to customs on an export declaration, at which time the exporter must show valid export documents from the producing country.

Several Exemptions

To avoid creating a new bureaucracy, the new regulation provides for a number of exemptions. The purpose is to "pare away" those firms which are considered to be obeying the export rules of other countries. The searchlight is being aimed at what the government calls the "unwholesome trade" engaged in by technology smugglers. The exemptions apply to:

1. Swedish goods--these are completely ignored by the regulation.

2. Swedish goods containing foreign components and Swedish goods that contain foreign "processed materials." This provision excludes a large share of industrial exports (on the other hand, it means that the regulation does not cover a new Datasaab deal in which American components are included in a Swedish computer).

3. Conscientious firms may be exempted by customs. But Bjorn Eriksson, general director of customs, says that even the goods those firms export will be subject to spot checks.

4. Lastly, customs may grant exemptions in the case, for example, of exports intended for fairs and such personal equipment as personal computers.

Hard To Interpret

The definitions provided in the regulation are going to raise several difficult problems for customs when it comes to interpreting them and knowing where to draw the line. One problem is that most COCOM countries do not have rules or licenses comprehensive enough to make it clear how Sweden is to proceed. This involves goods that are reexported from Sweden when their reexport is not covered by a license. In the case of exports to Eastern countries, customs will be compelled in practice to take a peek at how COCOM has evaluated similar export deals.

Customs Director Bjorn Eriksson says: "Yes, it is probable that we will base our evaluation on the way similar cases have been handled by COCOM. But we

are in the initial phase and have not yet had time to get into details. It will be primarily up to the exporter to show that it is okay to export the goods. If he can't make us believe it, the goods will have to stay where they are until the whole thing is cleared up."

The government is giving the Stockholm Chamber of Commerce an important role to play as adviser to the firms. The head of the chamber's foreign department, Tell Hermanson, says:

"With this system, we have achieved a level of control that is actually much better than its counterpart in most other countries. For one thing, Swedish firms have a knowledge and awareness of export rules that is completely unique, and for another, the 'technology bandits' can be stopped by legal means."

Great Haste

The government is bringing to completion the policy that began with the container incident in 1983. Sweden will not be allowed to become a transit country for smuggling the technology of other countries. The objective is to ensure Swedish industry's access to advanced technology. The regulation does not single out any countries, although in practice it is only the Western countries that have export controls, and those are aimed at the East.

The decision on export controls was reached at Olof Palme's last cabinet meeting on 27 February and will not be debated by Parliament. On that same day, Under Secretary of State Carl Johan Aberg, who had headed the work of drafting the regulation, left for Washington. He took his two most knowledgeable experts on the subject with him. The work of drawing up the regulation was done in great haste so as to complete it before that long-planned visit.

"We have continuous dialogue with the Americans on these questions," says Minister of Trade Mats Hellstrom, and he himself points out that the United States did not exert any pressure on Sweden. Mats Hellstrom also says that he knows nothing about the concern over Sweden's lack of export controls that NY TEKNIK has reported from other capitals. The minister of trade does not believe there will be any criticism from Moscow:

"Sweden is introducing a regulation to avoid a type of transit trade that is illegal in other countries, and I think the Soviet Union understands that."

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WEST EUROPE/TECHNOLOGY TRANSFER

FRENCH, LUXEMBOURG COMPANIES IN COURT FOR EMBARGO VIOLATIONS

Luxembourg LUXEMBURGER WORT in German 15 Mar 86 p 3

[Article: "Key U.S. Technologies, Subject to Licensing, Caught up in the Machinery of Jurisprudence--At First, Not Much Talk About the Prohibited Transit of Strategic Material From the United States Via France and Luxembourg to Moscow"]

[Text] Yesterday morning, after a 2-hour session before the Seventh Criminal Court of the Luxembourg Police Court, the second round of hearings involving a technology smuggling trial of international dimensions was maneuvered into a narrow spot by the defense attorneys and permitted the actual objective of the trial to fall into the background. As a result, Court President Paul Hever announced that he would render an interim verdict this coming Friday. This verdict is intended to clarify whether--as demanded by the defense attorneys for the five accused French nationals--the secret list of the COCOM (Coordinating Committee for Multilateral Export Controls), containing materials subject to licensing procedures, must be presented or whether the regulation of 17 August 1982, resulting from agreement between members of the Western Defense Alliance, along with its appropriate commodity listing, would be sufficient to reach a verdict. The interim verdict is then to be followed by the setting of a new trial date, which thus puts off a definitive decision regarding the Moscow-destined cargo which was confiscated in May 1985.

U.S. Product Listed as Being French

With the exception of the general director of the national airline "Air France," all other accused had appeared: the general director of the "Les accessoires scientifiques" Co., with headquarters at Varigney (Conflans-sur-Lanterne); an employee of the customs agency and highway transport firm of "Ferry Mougin" from Vesoul; the branch director of the "Gefco" Customs Agency, located at the Basel-Mulhouse Airport; and a clerk of the "Air France" commercial section. For the defense, seven attorneys (three from Luxembourg and four from Paris) were present. As during the first trial on 26 February 1986, the prosecutors included substitute Jean-Claude Frising, attorney Me Pierre Bermes (representing the accusing finance minister), and Arthur Beck, inspector first class of the Customs Administration.

The first and only witness yesterday was Luxembourg nuclear engineer Raoul de Waha, a former radiation expert with the public health service and recently employed by the European Patent Office in The Hague. He first reported about his findings which he made when he was summoned as a specialist for the Customs Administration in May 1985 to view the suspicious five wooden crates containing the subject freight. Without being an electronics expert, he had been able to immediately recognize the systems which were involved. He had also quite rapidly noted that the apparatus, which had been listed as a French product or French license product, was of U.S. manufacture which served in the production of highly developed electronic semiconductors. Subsequently, the COCOM regulations were studied and international contacts were made which led to the fact that the very next day an expert from U.S. Customs showed up to render his opinion. An additional foreign expert was summoned--the chief of the license office and of the Customs Administration, whose final conclusions were captured in a written report.

"Only Two Firms in the World..."

On a large slate chalkboard the expert witness then explained to the court, with schematic drawings, the various technical use possibilities of the confiscated transit materials. The expert repeatedly underscored the outstanding characteristics of the "ionic copper engraver." Its products showed a high integration level and there were currently only two companies in the world which are capable of producing such sophisticated equipment.

Double Use Possibility?

When the witness spoke of the fact that the apparatus had flexible use possibilities, the accused director general of the French firm "Les accessoires scientifiques," the company which, in the final instance, appeared as the seller to "Technoprimimport" in Moscow, intervened with two specialized questions. He referred to the firm's advertising folder which clearly lists the various use possibilities of the equipment. Nevertheless, no one came up with the idea of acquiring and using this expensive device, which is designed to engrave deeper lines, only for dispersion purposes. As a comparative answer to the suggestive question whether the instrument under discussion could be used to fabricate one or another item, the witness mentioned the example of a Cessna sports aircraft. This aircraft can also be used to cross the street to Paris and yet the owner would acquire it logically in order to fly there.

At this point, the defense switched to pure lawyers' tricks by demanding the presentation of the COCOM export prohibition list and attempted to interpret the denial of this document as a violation of Article 6 of the Human Rights Convention which guarantees the defense certain rights. As the representative of the accusing finance minister, Me Bermes responded that the presentation of this "secret document" was not possible because the prosecution was based on violation of a Grand Duchy regulation dated 1982 which, for its part, took over the export limitations of the COCOM list more or less intact. This justification was said to be sufficient, all the more since the Luxembourg court authorities only need to deal with the affair as of the Duedelingen border control post. In the final analysis, only one attorney from Paris defended

the view that the sentencing of his client because of these export regulations represented a violation of Article 10 of the European Community Transit Regulations.

Following a short recess and individual interventions, which did not introduce any new elements into the discussion, President Hever announced that he would render an interim verdict next Friday.

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WEST EUROPE/TECHNOLOGY TRANSFER

SMALLER COMPANIES TARGETED FOR INDUSTRIAL SPYING

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
21 Mar 86 p 4

[Article by Franz Xaver Koenigseder: "What Is Betrayed Can No Longer Be Sold--Industrial Espionage: Middle-Size Enterprises Are Particularly Endangered"]

[Text] To work out an offering is high art. To make it attractive and telling is the goal of every enterprise.

Offerings are increasingly utilized by Eastern countries for many years for purposes of economic and scientific espionage. The seeking of offers has developed into a regular "equalizing loan technique." How profitable this method can be can be seen when one considers that a written offer is generally followed by extensive conversations.

The Written Offer Is Followed by Conversations

A few days ago, Heribert Hellenbroich, the retired president of the Bundesnachrichtendienst, noted in an interview that one would have to depart from the common concept that desirable information was always only obtained through "dead letter drops, secret writing ink, and agent radios." According to Hellenbroich, overt procurement is at least as significant as secret espionage of the classic type. In this respect, proposals for bid play a great role. Hellenbroich recommended that enterprises make their offers useful and their products capable of performance but should not reveal the scientific-technical know-how behind them. This is new to many, but today is an aspect of making offers which is important to survival. The significance assigned to this situation is made clear by testimony of the Romanian defector Ion Mihai Pacepa, a former section chief in the Romanian Intelligence Service (CIE) and personal specialized adviser to Nicolae Ceausescu, who settled in the United States in 1978. Speaking before the Institute on Strategic Trade, Pacepa detailed, in 1985, Romania's procedures in the event research or technology problems occur.

First, teletype messages are dispatched to key enterprises in the Federal Republic, Great Britain, France, and Italy, in which it is indicated that there is interest in license contracts and deliveries. Soon the enterprises dispatch delegations with appropriate offers to Bucharest. The competitors, according to Pacepa, mutually outbid each other in terms of highly valuable

information. Pacepa reported that a French team--being concerned about its important documents--asked that they be locked in the hotel safe overnight. The safe proved to be so "secure" that the Romanians were able, in the long run, to build the desired facility themselves.

While large enterprises which have been active in trade in the East for some time have collected experiences and know what the problem is with regard to such risks, middle-size and smaller enterprises, which have just recently begun doing business with the East or which, perhaps, are about to make their first transaction, are fully exposed to these risks.

Even under these aspects, the desires of the East to do better in business transactions with middle-size enterprises must be seen. The East bloc countries are frequently prepared to give up the customary compensation transactions. According to GDR statistics for 1985, some 60 percent of GDR imports from the Federal Republic involve enterprises which employ fewer than 500 persons. According to the experiences gathered by the Institute for Security Research, enterprises of this magnitude are less familiar with the partially quite complicated foreign trade regulations, as well as with the dangers of industrial espionage than are large-scale enterprises.

The Economy Must Become More Sensitive

The problem of scientific and economic espionage is highly topical because effective countermeasures can only be created by a highly sensitive economy. The Federal Republic lags considerably behind the United States in this area. A high degree of sensitivity and protective measures are the topic of the hour. This was recently confirmed by Dietmar Schlee, the interior minister of Baden-Wuerttemberg, who stated that the threat to the economy as a result of a constantly growing number of ever-better-trained agents is increasing at such a rate that defense against this type of espionage effort is becoming an economic necessity. This is so because that which has been betrayed can no longer be sold.

5911
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WEST EUROPE/TECHNOLOGY TRANSFER

ITALY'S ITALTEL SIGNS CONTRACT WITH PRC

Milan TECHNICHE DELL'AUTOMAZIONE E ROBOTICA in Italian Feb 86 p 23

[Text] Italtel's bid was the winner in the bidding for a huge contract calling for provision of transmission products and technology to the Chinese People's Republic. They will be used to design and build the telecommunications systems called for in the PCR's plan for the sector. This is one of the biggest contracts ever signed in China for purchases of foreign technologis.

The contract was signed in Beijing in the house of Parliament between Italtel and the agency of the Chinese Foreign Trade Ministry (CNTIC), before Chinese foreign-trade and postal and telecommunications spokesmen. The project was developed as part of the two-way trade programs generated by the governments of both parties.

The first contract is worth 30 million lire, and there may well be major extensions of the contract to meet China's growing needs under its commitment to develop a nationwide telecommunications system.

Following the signature ceremonies, an Italtel delegation, headed by Director-General Marisa Belisario, was in Beijing for a series of meetings with Chinese postal and telecommunications and foreign trade officials. The purpose of that visit was to explore jointly the likelihood of further developments under the present contract and, more generally, trade relations and and collaboration between ITALTEL and the Chinese People's Republic.

Under the contract already signed, the city of Chongjing, in Sichuan Province, will be the site of the first Chinese plant to produce digital transmission equipment. Italtel will grant a licence to manufacture its complete range of Pulse Code Modulation (PCM) systems and will supply the production lines, technical assistance, and training for plant personnel.

6182
CSO: 3698/397

MONTEDISON DISCUSSES COOPERATION WITH USSR

Milan COMMUNICAZIONE MONTEDISON in Italian Dec 85 p 16

[Text] "I got a very good impression of the new young blood brought into the Soviet governing class. The quest for practicality and cost-efficiency, coupled with the readiness to shoulder responsibility Gorbachev insists on, are instantly evident, especially by comparison with the past." That was Mario Schimberni's first comment on his return from a 2-day stay in the Soviet capital, during which he met with ranking officials from the economic and industry ministries, and also laid the groundwork for further expansion of the already good relations between the Soviet Union and Montedison. Schimberni met with Deputy Prime Minister Riabov, Chemicals Minister Listov, Deputy Foreign-Trade Ministers Suskov and Komarov, Foreign Minister Rizhov, Operational Sector executives Lushkin and Diumaiev, and with President Ivanov of the Foreign Trade Bank.

After the talks, Schimberni spoke of "reasonable probabilities" in connection with the chance of Italy's ENI-Montedison consortium's getting the contract to build and turn over, keys-in-hand, a big petrochemical plant at Prikomsk in the Stavrapol Region, to cost about a billion dollars. "The European and Japanese competition, Schimberni said, "is very strong, but there is good reason for optimism in the high esteem in which Italian chemical expertise, public as well as private, is held by the Soviets we talked with: both sides of the industry were seated together at the negotiating table, and we proved that we are competitive all over the world."

As for technical and scientific collaboration, a relationship Soviet authorities scrutinize with the closest attention, Montedison's CEO reminded them that "the company can be pround not only of having completed some 40 plants very like the one planned for Prikomsk, all of them sound and running smoothly in disparate conditions of environment and temperature, but also of being capable of providing the necessary know-how gained from the basic and applied research to which our group allocates massive resources." Significant confirmation of this Italo-Soviet unity of purpose and intentions comes from the decision to convoke an extraordinary session of the joint commission in February 1986 to look into possible areas for joint research.

The Soviet side showed interest as well in the new strategic structure at Montedison, which calls specifically for developing four super-divisions: petrochemicals, specialty chemicals, energy, and services.

Immediately after the meetings between Schimberni and the Soviet authorities came the announcement of the first concrete result of the Moscow "summit": a firm order for engineering, materials, assistance and supervision in assembling and start-up for a plant to turn out 10,000 tons per year of polycarbonates, an order passed on to Tecnimont, the engineering division of Me.TÁ Initiatives. The $40-million (some 70 billion lire) contract was signed for the Italian side by Tecnimont CEO Rosario Alessandrello, while the Soviet signatory was the deputy minister for the chemical industry, Z.M. Poliakov. Technimont is the first Italian engineering company to undertake a construction job in the Soviet Union that will utilize the client's own technology.

Polycarbonates make up a family of technopolymers that are considered particularly advanced, owing to their excellent physical and mechanical properties.

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WEST EUROPE/TECHNOLOGY TRANSFER

BRIEFS

FRG POLYMERS FOR SOVIET PIPELINE--A contract for keys-in-hand delivery of two plants to produce a total of 19,000 tons a year of polymer sheathing to insulate gas and oil pipelines has been signed in Moscow by the Soviet technology agency, Techmaschimport and Hamburg-based Hermann Berstorf Maschinenbau GmbH. The cost will run over 266 million marks and delivery is to be made by the end of 1988. Working as sub-contractors on the project will be Kloeckner Industrie-Anlagen GmbH of Duisburg and Denso-Chemie GmbH of Leverkusen. [Text] Milan MATERIE PLASTICHE ED ELASTOMERI in Italian Dec 85 p 679] 6182

CSO: 3698/397

EAST EUROPE/CHEMICALS/PHARMACEUTICALS

PRODUCTS, EXPORTS OF GDR PHARMACEUTICAL COMBINE

Warsaw PRZEMYSL CHEMICZNY in Polish No 10, Oct 85 pp 495-496

[Article by Gabriele Gerstner, Foreign Trade Center Germed-Export-Import in Berlin (GDR): "Drugs from Germed Factory at the Service of Health Care"; the first paragraph is a summary]

[Text] The production program of the pharmaceutical industry of the GDR is discussed, characterizing the major units belonging to the concern FEB Pharmaceutisches Kombinat Germed in Dresden, which is the major producer of pharmaceutical products in the GDR. The export of these products, which is handled in the GDR by Germed-Export-Import Foreign Trade Center, is discussed with special focus on trade with Poland.

The export of drugs manufactured in the GDR is conducted by Germed-Export-Import Foreign Trade Center in Berlin. The center offers the products of the pharmaceutical industry, which has annual sales measured in billions (of GDR marks) and employs more than 15,000 people. The nomenclature of drugs offered by Germed, manufactured both for medical and veterinarian uses, totals more than 1700 items, not only meeting domestic needs but also being exported to 65 countries. Germed owes its posture in the world market to the fact that it attaches major importance to scientific and technological progress. Research to ensure progress in the synthesis of new drugs and the development of new processes for production of active substances or final forms is conducted mainly at the main plant of the combined concern in Dresden. Thanks to this research, a large variety of GDR-manufactured drugs are available, covering a wide spectrum from traditional to most modern preparations.

The drug industry in the GDR is regulated by new and stringent legislation. All new drugs are subjected to pharmaceutical, pharmacologic-toxicological and clinical investigations using state-of-the art research methods. Government oversight covering all phases in the development of pharmaceutical preparations, from the permission to use, to manufacturing, to quality control, is provided as far as medical drugs are concerned by the Ministry of Health, and for veterinary drugs by the Ministry of Agriculture, Forestry and the Food Industry operating through the medium of authorized institutions. This activity involves the control of manufacturing and warehousing of pharmaceuticals and the inspection of quality control units at plants in

terms of compliance with the national standards and international regulations concerning the manufacture of drugs (in particular, the WHO manual "Good Manufacturing Practices").

Owing to the continuing effort to raise productivity and make the process more efficient, the pharmaceutical industry of the GDR is capable of responding to changing demand and import requirements with a high degree of flexibility. The long-term plans of research conducted by the pharmaceutical industry are coordinated with the plans of the Academy of Sciences of the GDR, universities and medical institutes. Cooperative research is conducted on new antibiotics, cardiac preparations and drugs used in the treatment of circulatory diseases, as well as psychotropic durgs. Lively cooperation is also under way with other CEMA nations where the main goal is to speed up the development of new processes in the manufacturing of drugs and the introduction of these processes into industrial practice. The operation capacities of units involved in toxicologic research have been expanding steadily.

For over 35 years the industry has been maintaining sound trade relationships with Poland, dedicated to the common goal of the steady improvement of public health. In Poland the principal trade partner of Germed is the Foreign Trade Center CIFCH. The cooperation is based on long-term agreements and also short-term contracts for reciprocal deliveries. The export of pharmaceuticals from the GDR to Poland has increased between 1981 and 1985 by 110 percent, including 90 percent of sales of finished drugs, mainly cardiac preparations and drugs for circulatory diseases, which have been enjoying a steadily growing demand. In addition, the list of products supplied to Poland includes: laboratory agents, medical gypsum, active substances and rubber medical products. In the future, supply of injection materials is also envisioned. The pharmaceutical industry of the GDR is also willing to meet Poland's demand in other medical and veterinary drugs, chemical agents, etc. The expansion of the exchange will be facilitated by the scientific and technological cooperation and agreements on specialization and cooperation of production. Currently, in Poland, 43 drugs manufactured in the GDR have been registered and permitted for use. Another 18 drugs are currently being prepared for licensing. Since 1973 the GDR has been exhibiting its pharmaceutical products at every International Fair in Poznan.

In general, the exports of pharmaceutical products from the GDR include: medical and veterinary drugs, vaccines and raw materials; stomatological drugs, accessories and instruments; means of medical and veterinary diagnostics; products for health care and rubber medical products; active pharmaceutical substances, accessories and other chemicals; laboratory and industrial chemical agents; in addition, the export of services has been conducted, such as the sale of licenses. The GDR offers the following comprehensive manufacturing technologies:

--licenses for the production processes to manufacture Ergambur, insulin, calciumpentothenate, bromhexin, Elymoclavin, Nourseothricin and Xanthin-derivatives;

--know-how for the manufacturing of galenic preparations; and

--scientific assistance in the introduction of modern efficient methods of pig feeding (provided by specialized Livestock Breeding Research Center at Dunnerstorf-Rostock), utilzing Germed's preparations: Suisynchron-Premix^{R}, Suidor^{R}, Premagon^{R} and GnRH.

Among the numerous license offerings from Germed-Export-Import, special mention should be made of the production process of Nourseothricin preparation (licensor: FEB Jenapharm., 6900 Jena); this is an antibiotic used for livestock breeding; it is produced by fermentation of a specific strain of Streptomyces noursei and elimination of the adsorbate-containing cells. Nourseothricin is used as an additive to animal feed with positive effect for weight gain of piglets, farrows and hogs. The weight increase amounts to 5-15 percent, while the amount of feed can be reduced by 3 percent.

The description of plants belonging to FEB Pharmaceutical Combined Concern Germed in Dresden should begin with the main enterprise, namely, FEB Arzneimittelwerk in Dresden. The plant primarily manufactures cardiac preparations, as well as circulatory drugs, psychotropics, antibiotics and other biological preparations. Similar to other large plants of the concern, FEB Arzneimittelwerk carries out the complete manufacturing cycle, from the synthesis of active substances to manufacturing of the final forms (tablets, dragees, ampoules and freeze-dried materials), but the main operation is chemical synthesis, which accounts for 60 percent of commercial output. In addition, the plant produces herbal preparations, enzymatic forms and diagnostic or specific compounds for diabetics.

VEB Jenapharm has production lines manufacturing antibiotics, steroids, vitamins C and medicinal plasters. The program comprises chemical and microbiological synthesis, as well as production of finished forms: ampoules, sterile bottles, tablets, dragees, soft and hard capsules, ointments and suppositories, and also various health care supplies such as plasters. The factory is an important partner of the agricultural industry as a producer of fodder antibiotics and medications controlling the animal mating instinct.

VEB Berlin-Chemie, the largest chemical factory in the nation's capital, manufactures a varied assortment of drugs. It is the only producer in the GDR of sulfonamides and antidiabetic injection materials. Among the more valuable products are Berlophen and Berlamin, growth-promoting preparations (nutritantia), injection solutions based on pure amino acids and chloramphenicol, an antibiotic produced in various forms. The enterprise is the largest producer of rectal suppositories in the GDR. It also manufactures veterinary drugs and plant protection chemicals (the names of these products include the term "bercema," referring to the manufacturer's name), industrial chemicals, materials for the cosmetic industry, protective chemicals for construction materials and radioisotope-labeled agents.

VEB Chemisch-Pharmazeutisches Werk in Oranienburg produces basic pharmaceuticals in large amounts (salicylates, pirazolone, chlorocholine and their derivatives or intermediate products), and also a large number of pharmaceutical forms including antipyretics, analgesics, cardiac and circulatory medications, as well as antihypertensives and tranquilizers.

VEB Leipziger Arzneimittelwerk specializes in ointments and stomatological pharmaceuticals, instruments and health care accessories, and also the production of solutions for internal and topical administration, powders, emulsions and herbal tinctures.

VEB Laborchemie in Apolda specializes in the production of laboratory and industrial chemicals, in particular materials used in microelectronics and laboratory diagnostics.

VEB Isis-Chemie in Zwickau produces cardiac drugs and medications for circulatory diseases.

VEB Ankerwerk Rudolstadt specializes in liquid preparations and manufactures, among other products, cough and eye medications and drugs in aerosol form.

VEB Philopharm in Quedlinburg produces phosgene derivatives and semi-finished products for the manufacture of psychotropic drugs.

VEB Pharmazeutisches Werk in Halle manufactures various types and forms of dragee products, herbal preparations and world-renowned beverage concentrates.

VEB Serumwerk in Bernburg is the main producer of veterinary drugs, and VEB Esparma in Magdeburg is the main manufacturer of medicinal soaps and balneological products.

A new plant is under construction which will produce antibiotics and other biopreparations: VEB Pharma in Neubrandenburg.

9922
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EXPANDED USE OF 'APIS' COMPUTER SYSTEM CONSIDERED IN POLAND

Warsaw PRZEGLAD TECHNICZNY in Polish No 6, 9 Feb 86 p 15

[Interview with Lech Zieborak, chief design engineer of the Informatics Enterprises of Shipbuilding Industry, Gdansk, by Janusz Wikowski: "Apis: A Tested System"; date and place not specified; the first paragraph is an introduction]

[Text] The Apis computer system was developed for the shipbuilding industry more than 10 years ago! Then it was a novelty. How is this system fulfilling its function in the marine economy today? Is it possible to use Apis in other industries and in the central system of Scientific, Technical and Economic Information [SINTE]? These questions are discussed by Lech Zieborak, the chief design engineer of Informatics Enterprises of the Shipbuilding Industry in Gdansk.

[Question] To begin with, why don't you explain what the abbreviation Apis stands for?

[Answer] Apis stands for automatic search of synthetic information. It operates on the basis of EMC ICL 4/70 installed at our factory. We have developed two main modifications of the system: Apis and Apis-S, which are used in the shipbuilding industry. The first was introduced throughout the industry in 1973. This was not just a sign of unjustified ambition on the part of Polish shipbuilders wishing to look modern and progressive. The automation of the collection and retrieval of data necessary for ship designers, builders, economists and traders was necessary and indispensable. So they found the money to develop this system.

[Question] What does the Apis system do?

[Answer] The main function of the system is to supply information by using remote access units--screen monitors operating in a dialogue mode and providing interaction between the user and the system. Apis is basically a system providing bibliographic type of data, namely, indicating the sources of information, books and journal articles, etc. In addition, it makes it possible to collect and utilize documentation analyses and summaries or even entire texts of publications. Currently, two data bases are used in the system. One can accumulate 64,000 locations with various character

capacities. Altogether, up to 400 million characters can be accommodated. In quantitative terms, the bases of the system fill 20 million characters. More than 70,000 bibliographic entries have already been entered into the system, with 30 percent being the items with detailed information, such as technical specifications of ships. Before the end of the year, the files of the system will be increased by a further 10,000 bibliographic entries.

[Question] What is the basic difference between Apis-4 and Apis-S?

[Answer] Apis-4 uses 16 different parameters for indexing the individual items and for information retrieval or statement of queries; these parameters include, for example, the section of Universal Decimal Classification for Shipbuilding, names of countries, ships, factories, equipment and technical parameters (such as resistance, length, engine power), as well as formal parameters (publication type, language, year).

By contrast, Apis-S has a capability for using thesaurus terms for indexing and information searching. This is a language which is more convenient for communication with the user and is much selective than subject classifications used in Apis-4 (and other systems). Apis-S is a system of a new generation which is of a universal type. It imposes no constraints on the thesaurus structure or the subject areas of the information accumulated.

The system is quite simple in use. For maximum convenience of access to the information files of the system, auxiliary tools have been developed for the user helping him during the course of the conversation by supplying information on the principles of work with the computer, the contents of files, the parameters of information selection, etc. As a result, a user can operate the system without a manual. The capabilities for data input are varied, including the input from paper tape, magnetic tape or a floppy disk. These data are entered into the system at our center into EMC, but can also be transmitted from a microcomputer connected to our communication lines. Recently, a microcomputer was installed at the Shipbuilding Technology Center which makes it possible not only to access our files but also to enter new data into them. The format of information is arbitrary. It can be a bibligraphic entry, a documentation analysis or a summary. Also optional is the format and value of the indexing parameters of information (letter codes, digital codes, names, keywords, etc.).

The system has a capability for automatic editing and generation of matrices for publishing current awareness information materials and documentation reviews. This function can be performed in an arbitrary time cycle.

[Question] What equipment is required to be able to use your system and, of course, your data base?

[Answer] The customer must have a monitor connected to our communication line, e.g., IMP8502 or a microcomputer. A monitor is sufficient for remote transmission and communication with the mainframe computer and access to the

data bases. It is not as expensive as a microcomputer and offers substantial capabilities for using the system. We have a 10-channel network. Each channel accommodates three terminals. There is a technical capability for increasing the number of channels. Currently, only 10 terminals have been installed ...

[Question] What is the subscription cost?

[Answer] The cost is not high--about 30,000 zlotys monthly. For this fee the customer is allowed to use the mainframe computer for 5 hours (actual operation time). Each subsequent minute costs 100 zlotys.

[Question] And despite this low cost, you experience a shortage of customers seeking rapid access to information?

[Answer] Apart from the enterprises in the shipbuilding industry, Apis has not generated much interest. Other systems are being created, and there are also attempts to utilize imported systems. However, there is no standardized and centralized system that would allow the flow of information between industries and various scientific and technical research centers. For the INTE network, for example, the Swiss system ISIS was taken as a prototype. I believe, however, that Apis is competitive with it. This system has withstood the test of time. It is a "turnkey" operation. A case in point is the connection of a network terminal to the microcomputer at Gdansk Polytechnic.

[Question] If Apis is such a good system, as you describe it, why is it not used everywhere?

[Answer] In the shipbuilding industry, the system is being used successfully. Some enterprises have utilized it for collection and processing of ship data (for example, Centromor operates Apis-F system, which is based on the data from the Fairplay firm, describing the technological and operational characteristics of 25,000 ships built around the world). Variations of our system are used to process payrolls, personnel data and planning numbers.

In October of 1985 a mainframe computer, ICL4/70, was installed as part of the Apis-4 system at the Szczecin Shipyards. It uses a replica of our data base. Szczecin Polytechnic is already using this system. There are also plans for installing microcomputers and monitors at other scientific and technical information centers on the West Shore. We are promoting the possibility of introducing Apis at other centers. Together with the Marine Institute, we have developed a concept of information system for the marine industry. The project received a positive assessment and even won a prize, but ... it never went any further. The marine industry has no standard general computer system. This problem is not of an economic nature, because according to the estimates by experts from the Marine Institute introducing such a system would not involve major investment, and the benefits are obvious.

I believe that the introduction of automation in the information area has to surmount mainly psychological barriers. The computer requires people to change their style of work, and it seems that decision-makers don't like that ...

[Question] Can Apis be introduced as a basic system on a national scale in Poland?

[Answer] Experiences with modernization of our system could be utilized in developing a central system on the basis of Apis. We are currently discussing this matter with the management of the Center for Scientific and Technical Informatics.

[Question] Thank you for the interview.

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EAST EUROPE/COMPUTERS

ACTIVITIES OF PRAGUE INFORMATION EXCHANGE CENTER NOTED

Prague ZEMEDELSKE NOVINY in Czech 1 Feb 86 p 1

[Article by Drahoslav Zeman: "Information from the World Over"]

[Text] He Who Seeks Shall Find--the Answer is Found in SAVI.

Information is fundamental for every manager. Without it, he cannot make decisions, plan, and control. If he wants to be successful, this information must be complete--up to national and world standards--and precise. It must be available as rapidly as possible. Previously, it was enough to use libraries, documentation departments, archives and clipping services. However, this now no longer suffices--either for the manager or for scientists.

This is because of the rapid development of data transmission and telecommunications technology and, above all, the rapid growth in the volume of all types of information. As an illustration, in 1800 there were 100 scientific and technical magazines published worldwide, while in 1984 the total was over 100,000. It is simply not possible to wend one's way through the tons of available documentation and obtain the necessary information by oneself. Data banks have thus been established, as have arrangements such as SAVI.

These four letters designate the Prague Automated Information Exchange Center. From this center, there is a connection to the computers of almost the entire world, and it is to the center that the necessary information first comes. From 8 a.m. to 4 p.m., scientific and technical information is obtained. In the evening, business information is transmitted, and at night telemetric information is received, particularly data from satellites. SAVI is an independent department of the Center for Scientific, Technical and Economic Information (UVTEI). It cooperates with similar units in Poland, the GDR, Bulgaria, the USSR, Mongolia, Vietnam and Cuba. In addition, it also has ties to computers in the Western countries.

The main goal is to give SAVI users access to tens of millions of items of specialized scientific and technical data from the fields of economics, medicine, chemistry and others. There are stored either in our own data banks or mainly in foreign computer networks. To obtain this information,

we have a special microcomputer connected to similar central micro-computers in Moscow and Vienna. Through them, and perhaps through other central computers, questions are transferred to a computer terminal anywhere in the world. As is emphasized by the director of SAVI, engineer Zdenek Vanek, C.Sc., in devising the technical equipment for the Center the main objective was to achieve an actually effective operation. This meant attaining the highest possible effectiveness and quality and, at the same time, being cost effective. Therefore, no large computer was used.

The information obtained through SAVI is used mainly by employees of the UVTEI. Since 1982 (the year after the Center was created), in addition to foreign customers, two or three selected domestic units from each individual department are in contact with the center. They receive the information desired from socialist countries and in some cases from Western countries.

One of the direct advantages of cooperation with SAVI is, for example, the shortening of the study period required in solving a particular task of analyzing foreign enterprises, thereby reducing the costs of business travel and progressively allocating research and development tasks so that inquiry will not be made into an area that has already been researched. Among the indirect benefits is the early detection of trends in world business and the rapid processing of conceptual materials for economists. The possibility of assessing whether newly registered inventions are in fact new also exists. Last but no least, information from abroad can be used in determining licensing policy.

In relation to domestic organizations, however, SAVI serves only as a complementary system. The users, such as ministries, VHJs (economic production units), research institutes and others, are responsible for first ensuring, before they contact the center, that they have exhausted all means of obtaining the necessary information using their own resources or the computers at the UVTEI or at the Center for Scientific and Technical Information for Agriculture. It must always be remembered when putting questions to a foreign data bank that most of the time the service that must be paid for in foreign exchange. Therefore, the information obtained from SAVI should serve mainly for fulfilling critical tasks. One system used to check this is the obligation of organizations to report the results obtained as a consequence of cooperation with SAVI.

On the basis of his own experience, engineer Vanek divides the users into three groups. The first is "scientists"--employees seeking a method, a new way of solving a task. The second is made up of "pragmatists"--persons interested in theory only when absolutely necessary, because they mainly need facts. These two types of users already have opinions of how best to solve a given problem. Either their method is borne out by the information they obtain or they find a better process. The third group of users is people who ask "to search for everything about this and everything about that." This approach shows that the user has no precise notion of the direction he wants to take in focusing his efforts. It is therefore often necessary when contacting a foreign computer--which is done in a dialogue mode when the users

are generally present--also to narrow down the subject of interest. This means gradually to choose those items of information which are actually to be used.

Analyses performed throughout the world have shown, for example, that of a select group of the 20 most significant U.S. companies, 19 make full use daily of information from various data banks. Last year, there were already 2,800 different data banks, as against 400 in 1979. The significance of the information is also proven by the fact that such information services are growing by 30 percent per year on average. Utilization of the information services provided by SAVI is an important foundation, primarily for effective decision making at all levels of management of the national economy and for successful work with the research and development base.

12993/12951
CSO: 2400/225

PRODUCTION CONTROL SYSTEM AT DANUBIAN IRONWORKS

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 pp 1, 5

[Article by Geza Szalay, Danubian Ironworks: "Production Control System at Danubian Ironworks"]

[Text] Within the framework of a demonstration on 5 December 1985 the leadership of the Ironworks evaluated the professional results achieved by the Steel Information Research-Development-Production Society (Acelinform) with the support of the KSH [Central Statistics Office], the Ministry of Industry and the OMFB [National Technical Development Committee] with the cooperation of Videoton, the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] and the Dunaujvaros College School of the NME [Heavy Industry Technical University]--as subcontractors. In the culture hall of the Ironworks directorate Dr Ferenc Szabo, director general of the enterprise, informed the members of the presidium--Gyula Sos, deputy minister of industry, Lajos Pesti, deputy chairman of the KSH, Dr Tibor Vamos, academician and director of the MTA SZTAKI, and Mrs Ivan Lelkes, a main department chief in the OMFB--and invited guests about the work and conception which began in 1977 and which will determine, until 1990, those tasks which the large enterprise wants to accomplish within the framework of an integrated enterprise guidance system.

As the first step in the work the Danubian Ironworks and the MTA SZTAKI submitted a competition in 1980 for the development of a model production control system, as part of the National Medium-Range Research and Development Plan. With the winning of the competition the model system became an organic part of the above conception. Some of the intellectual products produced in the course of system development can be adapted not only in the Danubian Ironworks but also, due to their general character, at other metallurgical enterprises and even in other branches of the people's economy.

In connection with recognition of the model of national significance, Tibor Vamos emphasized three interdependencies of it:

--the integration and complexity of the production control system,

--the cooperativity of the model, and

--the social model for using the new technology, computer devices, which simply by their use have an effect on work and leadership alike.

Then, under the leadership of Dr Laszlo Mudra, secretary of Steel Information, two colleagues from the Ironworks, main department chief Geza Szalay, as managing director of Steel Information, and main department chief Karoly Antal, chairman of the developmental council of Steel Information, gave a very impressive professional description, using charts and operational demonstrations both at the production sites and in the computer center of the Ironworks.

In the course of 5 years the Steel Information Research-Development-Production Society worked out and realized the planned production control system. The work began with great impetus but the first serious obstacle soon appeared--they failed to obtain the planned subcenter computer and also for the lack of material assets the central computer was put into operation late as well. Thus they did not have in time the tools needed to develop the planned system and settle general questions of basic software, database management and network control. It became obvious that they did not have sufficient experience to build up a vertical system of this size.

In the middle of 1983 the founding enterprises modernized the association contract; bringing in the Steel Information experts they found solutions for the subcenter to be established; they commissioned the Prague Software House of Videoton to solve the problems of the SZM-52 basic software; they took definite steps to acquire an ESZ 1045 central computer; and, in harmony with the expert and supervisory reports, they worked out work programs for the years 1984 and 1985.

The tasks realized as of 31 December 1985 are the following:

--the marketing-planning subsystem is in operation in the computer center and on the terminals of the leaders of the directorate;

--the production planning subsystem and the scheduling part of it (using the method of sliding planning) and the steel balance module, for the ESZ 1045 and the Varyter, are in operation in the computer center and in the office of the production chief engineer;

--of the production programming subsystem they have finished the product quality and listing modules for the cold rolling mill 1050 and 1550 cutting lines and for the hot rolling mill cutting line--running in the batched mode in the computer center;

--there are production accounting modules in the steel works, in the hot rolling mill and in the cold rolling mill;

--the modules for manufacturing tracking are in an online system in the steel works and the hot rolling mill and in a batched system in the cold rolling mill;

--mix computations are being done for the smelting works and agglomerating plant and the pig-iron balance runs on a computer; and

--they have also developed a batch control module for converter steel manufacture in the converter steel works.

Methods and Experiences

Steel Information borrowed from the enterprise system all those work organization methods which improved operability. Thus the organs of the Society were required to record their order of business and describe the responsibilities of their officials. The creation and composition of work groups was standardized; personal agreements were signed with those participating in software work in regard to the content, quality and formal requirements of the work to be done.

In the course of the work of the Society 118 enterprise experts were brought into the creation of software. Their selection took place on the basis of previously established criteria, with the agreement of the enterprise. Of these 70 did work at a higher level than the average and at present this staff of experts constitutes the intellectual base at the Danubian Ironworks which has been called upon to participate in completion of the model system and in system developments for the Seventh 5-Year Plan.

The links developed with the enterprises and institutions brought into the system development work are correct, effective and close; they regularly participate in the work of the Developmental Council. In addition to its very active participation in the work of the Society the MTA SZTAKI has done the research and development work connected with use of the DMS database management system and has developed an application for IDMS. It prepared a system plan for the computer network and basic software for the central computer, and it designed the software components for linking the ESZ 1045 and SZM-52 machines. In addition the SZTAKI prepared the program systems for production planning and programming and the program systems for marketing-planning. Going beyond the obligations of the Society there is constant program harmonization between the SZTAKI and the Danubian Ironworks and there are regular consultations in harmonizing the medium and short-range plans.

Contacts between the Danubian Ironworks and Videoton in the area of using computer technology tools go back to the beginnings of the 1980's. After they failed to obtain the subcenter computer planned within the framework of the model system the choice fell on an SZM-52 computer which, in its condition at that time, did not prove suitable for the task. The limitations of the DMS 600 database management system also fundamentally hindered realization of the planned user system. A fruitful link was established with the Prague Software House of Videoton to eliminate the limitations and as a result of it these limitations were eliminated and the SZM-52 functions as two independent machines, deviating from the originally imagined twin processor operation. One takes care of the remote data processing tasks of production control and the other serves software development. The programmers of Videoton also participated in preparation of various user programs for the manufacturing tracking system.

In the foreground stands the signing of a cooperation contract between the two enterprises within the framework of which Videoton will declare the Danubian Ironworks a reference plant on the basis of the size and role of the system being developed.

There is a medium-range framework contract with the Dunaujvaros College School of the NME for programming the manufacturing tracking systems of the steel works and the hot rolling mill, for developing database structure and for preparation of the manufacturing guidance subsystem. The manufacturing tracking system of the steel works has been in operation since 1 July 1985; completion and testing of the system for the hot rolling mill is under way at present.

It was shown that it is possible to achieve even more than the original goals. A production control system has been created which in places already reaches into an enterprise guidance system.

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ELECTRIC POWER RESEARCH INSTITUTE INSTALLS IBM 4361

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 pp 1, 8

[Article by Dr I. Sz.: "IBM 4361 at the VEIKI (Electric Power Industry Research Institute)"]

[Text] The computer technology activity of the Institute looks back on a great past. In regard to the device base they worked with an Elliott 803/B, then with a Soviet made transistorized Razdan-3 and finally with a GDR made ESZ 1040, at the time the first integrated circuit ESZ 1040 in the country. Their users embrace very many areas of the Ministry of Industry and of energetics.

In December 1985, within the framework of a serious professional demonstration in the presence of representatives of the Ministry of Industry, the OMFB [National Technical Development Committee] and the KSH [Central Statistics Office], the delivered IBM 4361 system replaced the almost 10 years old ESZ 1040 configuration. Made of very highly integrated elements it takes one tenth the space of the older machine and uses one fifteenth the power.

The special aspect of the IBM system here is that for reasons of thrift it is supplemented by Soviet-made card readers, Polish-made line printers, BASF disks and Hungarian or Polish-made telecommunications network elements. Coordinating the various types of equipment required significant hardware and software work, which the cooperating organs succeeded in accomplishing.

The new central unit, the 4361 Mod 4, represents the most modern level which can be delivered today. The IBM was announced in 1983, only 2 years ago. This is the first such system in our country. It has operational storage of two M bytes, twice that of the ESZ 1040; its speed is 4-6 times greater, based on the time to run jobs through. Half an M byte of memory is placed on each card of the processor, which has a very small size physically. The arithmetic and channel units are made of very highly integrated circuits. The floppy disk built into the machine makes it possible to change the microprogram store and there is a device to record possible machine errors.

The GDR magnetic tape units, mechanically completely used up after 10 years, were replaced with self-feeding magnetic tape units working with two writing densities (800 and 1,600 bpi). The smaller writing density was needed in order

to maintain contact with a large number of computers working in the energy industry. The configuration is supplemented by several disk drive units working with hermetically sealed disk packs.

A special cable connects the IBM-ESZR units; the IBM is at one end and the so-called NABOR couplings are at the other end.

Special mention must be made of the hardware, software and organizational solutions for converting between the two machines.

Since preparation of a number of very important tasks which run periodically in the computer center with a time limit could not suffer injury the stopping and dismantling of the old machine and the installation and initial operation of the new machine replacing it had to be prepared with special care. A virtual machine providing the services of the ESZ 1040 was prepared with a very large amount of software work, with the aid of similar domestic and foreign machines and by exploiting the software possibilities of the virtual machine concept. The installation and conversion of the computer center was fixed in a strict schedule.

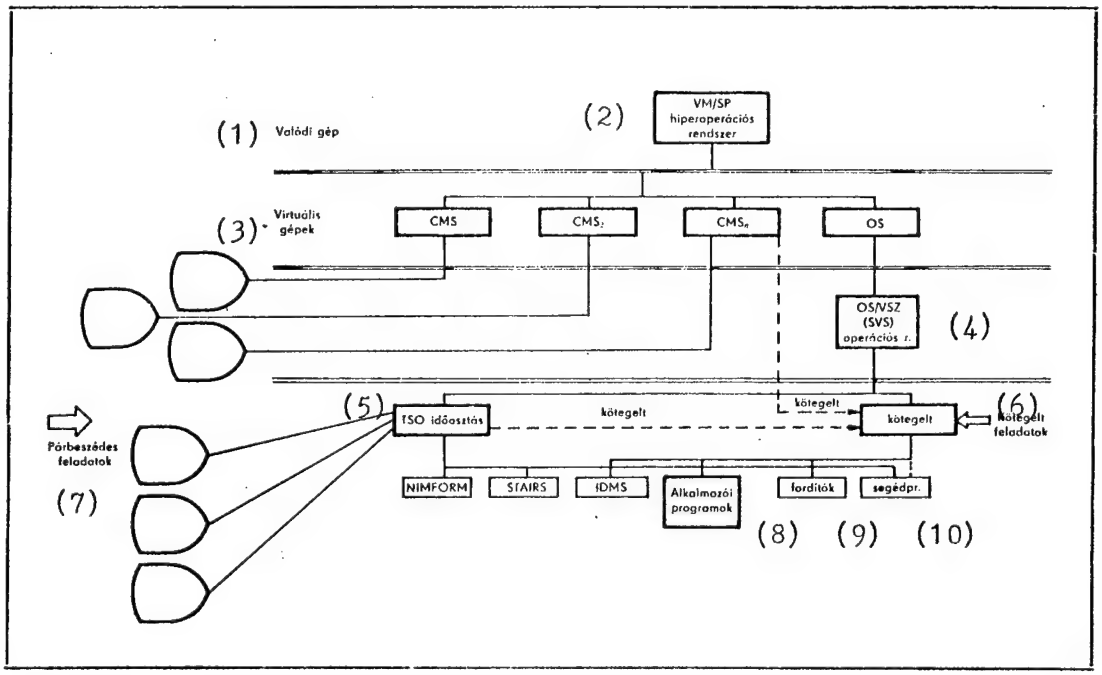
The computer was working on user jobs only a few days after delivery, it ran the terminal network and operated at about 85 percent of the processor load in three shift operation.

In the course of acquisition and installation those involved showed exemplary cooperation, helping the Hungarian electric power industry and the Ministry of Industry to gain access to an efficient system which will be modern for a long time. It offers new prospects for the stable collective of the computer center (which after the exemplary pioneering and persistent professional work of early years is now operating a system incomparably more modern than before and will do further developments and solve new tasks on it). We can count on a proliferation of VEIKI achievements, already recognized in our profession.

The task of the machine, supplied with a modern program system, is to participate in planning and operational computations for the Hungarian energy system, plan a high voltage network, operate the databanks of the power plants, do long-range planning for energy consumption, manage safety and investment systems, serve information systems and participate in the tasks of the Ministry of Industry, to mention only the most important.

The computer center is already in contact with the Ministry of Industry, the MVMT [Hungarian Power Plants Trust], Eroterv [Power Plant Designing Enterprise], the AEEF, Hydrocarbon Industries Research and, naturally, the other sites of the institute via leased Postal or connected lines. With the aid of the connected lines it is possible to access the computer from any location. In regard to the technical solution they are using point-to-point, multi-point and connected links via a domestic or Polish multiplexer. At present 25 terminals, either domestic or manufactured in another socialist country, are operating in the system network. They intend to increase this number continually in the future.

The IBM Software Configuration



Key:
1. Real machine
2. VM/SP hyperoperating system
3. Virtual machines
4. OS/VSZ (SVS) operating system
5. TSO time sharing
6. Batched tasks
7. Conversational tasks
8. Applications programs
9. Interpreters
10. Auxiliary programs

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PORTABLE LD-C28 DATA COLLECTOR

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 3

[Article: "LD-C28 Portable Data Collector"]

[Text] The device is of microprocessor construction and serves to collect and store 28 K bytes of numeric information. The collected data is read out by the computer doing the data processing. The number and length of records and the length of individual record elements within records can be varied as desired by changing the internal program. The data transmission speed can be selected between 300 and 9,600 baud to each of the customary baud values. Text messages provide information about the more important operational conditions such as FULL, READING, etc. Alphanumeric mnemonics aid the writing in of the desired data.

It is possible to "page" backward or forward in memory by record elements, at which time the content of the memory appears on the display also. The power requirement is under 10 mW, which ensures several days switched on operation from a dry cell or storage battery.

An accessory of the simply operated device is a network power unit which can be used for local operation or to charge the storage battery. This includes the baudrate generator needed for read out.

With the program developed at present--which is a warehouse inventory program--one can store 1,200 data records with a length of 23 bytes.

The structure of the data record is as follows: memory location code 5 numeric characters, article number 7 numeric characters, quantity unit 2 numeric characters, and quantity 8 numeric characters plus decimal point. The more important technical characteristics include: capacity of 28 K bytes of numeric information, alphanumeric display, coupling surface three-line RS-232/V24 (if desired the modem control signals can be led out also), data transmission three-line half-duplex, data transmission speed 300 to 9,600 baud (selectable), power supply 9 volt IEC 6F22 dry cell or storage battery, and power consumption less than 10 mW.

A network power unit and cable are accessories.

An accessory which can be purchased is an RS-232 interface for a C-64 computer.

The equipment was developed by ERFI (the Heavy Current Product and System Development Subsidiary of the VBKM [Electrical Equipment and Appliances Works]). It is sold abroad by Metrimpex and domestically by Szamrend [Joint Enterprise for Marketing Computer Systems]. The guide price is 36,000 forints, which can be reduced to around 20,000 forints in the event of a suitable series size.

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BENCHMARK MEASUREMENTS OF TWO TPA-11 COMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 4

[Article by Istvan Csanyi, Tibor Forro, Agnes Hajduk and Gabor Kelen of the KFKI (Central Physics Research Institute), Metrology and Computer Technology Research Institute: "Benchmark Measurements Comparing the Performance of TPA-11 Megamini Computers"]

[Text] Evaluating the performance of computers is very essential when selecting computer systems, making plans and analyzing existing systems. The goals of the evaluation determine the level of the performance measurement. Performance is determined by the hardware and software, and by the load on the system, total and in sequence. It is difficult to separate the effect of the several components. For this reason it is customary to speak of evaluating the performance of computer systems.

In the course of our studies our goal was a comparison of the TPA-11/440 and TPA-1148 megamini computers. Using benchmark measurements we determined the time to execute the several machine instructions and the time to run simple FORTRAN, COBOL and Assembly programs.

Hardware and Software Environment of the Measurements:

Category	1148	11/440
Memory (K bytes)	1024	1024
Cache memory	no	yes
Address arithmetic (bits)	22	22
Floating point processor	no	yes
Floating point (FIS) instruction set	yes	no
Business instruction set (CIS)	no	yes
Operating system	RSX-11M PLUS	for both
FORTRAN interpreter	FOR	F77

The measurement programs were run as user programs in the RSX11 operating system. The given measurement program was the only user program in the system. In the course of the measurement the program only used the processor, thus the extra time caused by the operating system was negligible.

Measuring the execution time for machine instructions took place in the following way. We filled a 1,000 word memory area with the code of the instruction to be measured and executed this instruction series 5,000 times. In the case of certain instructions (e.g., arithmetic operations) it was necessary to enter appropriate input data (operands) in order to execute the same instruction in every case. We took the entering of the operands and the end-of-cycle jumps into consideration in the correction. In the course of the measurements we also studied the various addressing methods.

Table 1 contains a few of the measurement results.

Table 1:

Processor Type	TPA-1148	TPA-11/440
CLR R2	1.68	0.85
CLR (R2)	5.21	1.66
CLR (R2)+	5.28	1.66
CLR ^ (R2)+	6.97	2.42
CLR - (R2)	5.27	1.90
CLR ^ - (R2)	7.15	2.42
CLR 0 (R2)	6.67	2.42
CLR ^0 (R2)	8.33	2.93
CLR (PC)+	5.25	1.66
CLR ^# DST	6.93	2.42
CLR DST	6.67	2.42
CLR ^ DST	8.33	2.93
BR .+2	2.73	1.30
MOV R2, R1	1.68	0.81
MOV (R2), R1	3.95	1.38
MOV (R2)+, R1	4.00	1.43
MOV ^ (R2)+, R1	5.68	1.75
MOV - (R2), R1	4.01	1.43
MOV ^- (R2), R1	5.68	1.75
MOV 0 (R2), R1	5.35	1.99
MOV ^0 (R2), R1	7.08	2.32
MOV # 1, R1	4.01	1.43
MOV ^# SRC, R1	5.68	1.75
MOV SRC, R1	5.36	1.99
MOV #1, DST	7.10	3.24
MOV ^# SRC, DST	8.84	3.83
MOV SRC, DST	8.46	3.81
MOV ^ SRC, R1	7.07	2.32
BNE .+2 (complete)	2.73	1.30
BNE .+2 (incomplete)	2.30	1.06
BEQ .+2 (complete)	2.73	1.30
BEQ .+2 (incomplete)	2.30	1.06

Note: The up-arrows (^) indicate indirect addressing.

The FORTRAN, COBOL and Assembly programs executed simple mathematical tasks. We can group the measurements as follows.

Magnetic Disk I/O Operations

Write, Read: The routines study serial processing; 640-character blocks are written to disk or read from disk.

Study of Basic Instruction Set

Movbyte: Moving a 500 byte data area in memory.
Movword: Moving a 500 word data area in memory.
Addn: Totaling 4-word whole numbers, A=B+C.
Muln: Multiplying 4-word whole numbers, A=B*C.

Vector Handling Operations

Getmax: Determining largest element of a 100 element vector, the elements of the vector are whole and floating point real numbers respectively.
Vecmul: Scalar product of a 100 element vector, the elements of the vector are whole and floating point real numbers respectively.
Vecadd: Addition of a 100 element vector, the elements of the vector are whole and floating point real numbers respectively.
Matmul: Multiplication of 20 x 20 element matrixes containing whole numbers.

Character Handling Operations

Check letter: Comparing the elements in a 20 element character series.
String compare: Comparing 20 element character series.

Simple Floating Point Operations

Fladd: The routine adds one millionth one million times.
Sin 2x: The routine calculates the value of sin 2x in two ways:

```
z=sin (2*x)
y=2*sin(x)*cos(x)
x=1... 10,000
```

Data Sorting Tasks

Quicksort: The routine sorts the elements of a block in ascending order in memory on the basis of the "Quicksort" algorithm. The elements are whole and floating point real numbers respectively.
Bubble sort: The routine sorts the elements of a block in ascending order in memory on the basis of the "bubble sort" algorithm. The elements are whole and floating point real numbers respectively.

Numeric Mathematical Tasks

Horner: Calculating the value of a tenth degree polynomial with the Horner method. The coefficients and the values of x are whole and floating point real numbers respectively.
Newton: Extracts the root from a real x with the Newton method. The calculation is done to the fifth iteration.

Simpson: The routine performs numeric integration with the Simpson method.

Benchmark Task

Erato. The program was published by Jim Gilbreath in BYTE magazine. In the first place it studied the abilities of languages in such areas as memory access, structured control instructions and simple I/O operations. For this reason it does not use multiplication/division and floating point arithmetic. The program calculates prime numbers with the "sieve of Eratosthenes" algorithm. Erato 1 is the time of the calculation; Erato 2 writes out every value to the terminal screen at 9,600 baud.

We performed the above tasks for the purpose of studying the speed of execution of the basic or floating point instruction set, thus we did not use the business instruction set on the TPA 11/440 computer. We performed the following tasks in a COBOL environment for the purpose of studying the efficiency of the CIS: ADDP7, ADDN7, MULP7, MULN7, DIVP7 and DIVN7--adding, multiplying and dividing 7 digit numbers in packed (2 digits per byte) or numeric (one digit per byte) character series format.

COMP7, COMN7: Performing the operation group ((A7+B)*(A7-B7))/A7 on 7 digit numbers in packed or numeric character series format.

The published time data pertain to executing the above tasks 30,000 times.

Table 2 contains the measurement results.

Table 2 (times in seconds):

Processor Type	TPA-1148	TPA-11/440
Write	22.88	12.94
Read	13.08	7.28
Movbyte	43.54	20.46
Movword	40.38	20.48
Addn n=4	22.60	10.52
Muln n=4	83.02	42.86
Getmax		
Whole vector	10.96	1.64
Real vector	13.72	2.54
Vecmul		
Whole vector	34.18	5.68
Real vector	40.00	8.58
Vecadd		
Whole vector	30.64	5.96
Real vector	43.14	8.38
Matmul	176.36	19.94
Check letter	7.36	0.72
String compare	14.80	1.58
Fladd	122.80	24.50
Sin 2x	47.74	13.50

Table 2 continued:

Processor type	TPA-1148	TPA-11/440
Quicksort		
Whole	25.72	3.82
Real	55.22	9.02
Bubble sort		
Whole	22.50	2.40
Real	31.88	4.78
Horner polynomial		
Whole	15.12	2.26
Real	24.48	4.34
Newton	15.34	2.90
Simpson	86.82	19.62
Erato 1	35.92	6.14
Erato 2	362.36	234.56
ADDN 7	22.26	3.04
ADDP 7	40.08	2.66
MULN 7	106.86	12.46
MULP 7	123.22	7.16
DIVN 7	81.22	8.38
DIVP 7	97.24	3.68
COMN 7	308.90	31.16
COMP 7	341.42	21.00

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USE OF USP PROGRAM PACKAGE ON TAP-34 MICROCOMPUTER

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 9

[Article by Jozsef Hetyei: "Use of USP Program Package on TAP-34 Microcomputer"]

[Text] The TAP-34, a product of the Telephone Factory, is one of the most popular and widespread microcomputers of domestic manufacture. It was one of the first domestic microcomputers; those making it had originally intended it primarily as an intelligent terminal.

Its operating system is very simple; the program named MONITOR (which is burned in) consists primarily of routines to manage the peripheral assortment at the physical level; in addition it performs system type functions (disk catalog display, listing of disk files, printing to the screen, etc.).

Programming Possibilities

Two types of programming systems are built on this base, the TERTA-BASIC interpreter program and the DP system. The latter is the developmental system for the TERTA-ASSEMBLY 8080 programming language, which consists of text editing, library handling, translator, error correction, etc. programs. (The TERTA-ASSEMBLY 8080 itself is an assembly level programming language based on an INTEL 8080; the cited services of the MONITOR program can be called as subroutines.)

If for some reason a certain task cannot be solved with the interpreter system then the programmer must work in the cited TERTA-ASSEMBLY language, and finds himself faced with the very large amount of work required by Assembler language programming. The manufacturers of the device recognized this problem when they developed the USP program package.

The USP Program Package

The USP (User Support Package) is a program package which is an aggregate of mutually interdependent 8080 Assembly language subroutines with mutual error handling and status indication which effectively supports preparation of applications programs and reduces the work needed for program development.

The USP routines must be loaded into memory (this can be done with the aid of the HXLOAD routine), then its services can be accessed with the CALL instruction from the user program. Thus the USP must be loaded once, thereafter it remains active until the equipment is turned off (or until the RESET button is pushed), presuming that we do not write out of the user program; the routines are placed in the hexadecimal address domain 76,000-A7.FF.

The USP Services

The USP routines can be divided into the following chief groups: data input routines, file handling routines, routines performing byte series operations, arithmetic (binary and decimal) routines, routines performing format controlled data movement and error handling routines.

The USP offers innumerable more services than the 8080 Assembly language; we will mention only a few of these:

--screen handling offering very many field level services and a data input system (many types of data checking and data handling activities can be requested in a parameterized mode),

--relative file handling (direct access on the basis of record number),

--record level data movement between disk units and memory,

--binary and decimal arithmetic operations which can be performed between fields (buffers)--four basic operations, comparison, rounding,

--format controlled (record level) data movement between buffers, in regard to screen memory or printer memory,

--definition of error message table, program branching depending on error codes.

Special Service of the USP

By using the relative file handling system of the USP it is realitively easy to get indexed file handling from the user program--thus providing direct access according to a logical key.

A special service of the file handling system of the USP is so-called search according to content! This is done by the SCAN routine.

With the SCAN routine we can perform a search in the record-structured data files to be found on floppy disk so that it is not necessary to decide in advance when writing the program which fields of the record will take part in the search and with what sort of values; any field of the record or optional fields can present a selection factor or factors.

Processing begins with data submission at the place of those fields of the record which the user has not filled in, thus they cannot participate in the selection, so-called "mask bytes" must be located (the code of the mask byte is OFF hexadecimal), thus the search can apply to records satisfying a relationship equal to or greater than, equal to or smaller than or equal to the given sample.

It must be noted that search according to content is truly effective if the length of the records of the data file is equal to the value 2 superscript n (n=1, 2, 3, 4, 5, 6, 7).

Thus, thanks to the services of the USP program package a very flexible query system which can be parameterized in many ways can be prepared for the TAP-34 equipment. This could have significance, for example, in an applications system where a large-computer, batched-mode processing system is supplemented by a microcomputer information system called upon to provide immediate, operational information; in this way many sorts of information could be queried from data files located in the microcomputer--with appropriately restricted data content and possibly distributed among several machines.

By using "search according to content" we can also prepare a system providing direct (quasi-direct) access according to a logical key; the advantage of this is that one need not handle separate index files and index records, the data located in the record is also the "index" (when searching, naturally, mask bytes must be placed on the other parts of the record).

But this method can be used only with relatively small files (400-500 items) and only in the case of records of the length 2 superscript n (n=1, 2, 3, 4, 5, 6, 7) because otherwise one gets very long response times.

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HSZR-MICRO: MICROCOMPUTER SPREADSHEET PLANNING PROGRAM PACKAGE

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 9

[Article by Attila Kovacs: "The Prize Winning Product HSZR-MICRO, a Microcomputer Spreadsheet Program Package"]

[Text] It has a large number of users, can be run on many types of computer and it won second prize at the Software '86 exhibit. These facts, among others, characterize the HSZR-MICRO microcomputer spreadsheet pachage being sold by the System Organization Enterprise. Seeking the reason for its success it appears that the enterprise selling it has prepared in time to satisfy domestic needs with a program package it developed itself, recognizing that with the great spread of microcomputers the users would like to solve their spreadsheet planning tasks with such a tool.

It is well known that today one can find among the applications program packages of almost all medium and large computer systems a spreadsheet software product. The System enterprise prepared the HSZR-II earlier (in 1981) and it is now used on nine ESZ 1022 computers among others. In 1984 the HSZR-MICRO was already operating on two types of domestic computers and it now operates on the following microcomputers: IBM PC, M08X, Proper-16, Comput-80, TAP-34 and Commodore-64. And a mini version runs on the TPA-1140 and TPA-1148 and on the SZM computers. In November of last year the number of applications in about 50 domestic institutions reached 60 and by the end of the year it approached 100.

A Combined MPM/CPM Method

The HSZR-MICRO has been prepared for machines working with the CP/M, MS-DOS or RSX-11 operating systems. Operation requires a minimum of 28 K bytes operating memory, one 8 inch or 5 1/4 inch floppy disk drive and at least an 80 position printer; in the case of a minicomputer it requires one magnetic tape unit. With the aid of the program package one can do all spreadsheet work, from structuring the work sheet through plotting it out all the way to preparing the various result tables. A function to be mentioned especially is work sheet editing and plotting. The program package is also suitable for combined handling of the modern MPM/CPM method--for MPM time analysis with CPM type plotting. A difference compared to large computer solutions is in the size of the spreadsheet to be processed; it is possible to process a spreadsheet

consisting of a maximum of 999 activities together at one time. According to the experiences of the trading enterprise this is sufficient for solving 80 percent of spreadsheet tasks. It would be uneconomical to use a microcomputer to process spreadsheets larger than this, primarily due to the large running time and the printing and data storage requirement. But the advantage of the HSZR-MICRO compared to large computer spreadsheet programs is that operational control is greatly aided with the conversational processing mode. Operation is simple. The screen is organized with menus and the instructions which can be given from the keyboard are always displayed. The keyboard is easy to operate, in addition to giving the instructions only DEL (delete preceding character) and CR (send message) or the two corresponding keys are used. The error messages use the Hungarian accented characters.

Opinion of Users

Among the applications areas the most characteristic are investment planning and maintenance organization, but the HSZR-MICRO is also used, for example, in resarch and development and production control, for educational purposes and in organizing agricultural work. Spreadsheet planning requires circumspect and basic organization. For example, in the case of an investment task one must break down the work sheet into sub-sheets one must estimate the frequency of updating, one must determine who is responsible for supplying data and what their tasks are, one must develop the result tables, one must decide who will get what from which tables, etc.

At the FUTI [Capital Construction Industry Operations and Business Office] they use the program package, consisting of seven programs, for preparation, on a Proper computer, of a sheet by structure for use in building renovation work. The large computer version of the HSZR is also used at the enterprise; the small computer spreadsheets are sent on to the larger system. In their opinion the applications possibilities would be expanded if the HSZR-MICRO were more open from the viewpoint of input and output management, and thus could be easily interfaced to other applications systems. At the Pipe Fitting Industry Enterprise they use the program package on a Comput-80 microcomputer to schedule construction industry jobs. According to their experience the microcomputer spreadsheet offers very good aid to both the chief fitting bosses and the higher level enterprise leaders. They consider the conversational processing possibility and the immediate task scheduling to be the chief advantages. At MALEV [Hungarian Air Transport Enterprise] they use the HSZR-MICRO to program aircraft maintenance jobs and determine the sequence of jobs. In their opinion the technological processes can be planned and modeled well in a flexible way by using the program package. At the Borsod Chemical Combine they use the program package for preplanning of investments (600 activities) and to track investments (200-250 activities). They make good use of an extra service of the HSZR-MICRO, compared to the large computer solutions, in that it can also handle different categories of time data (for example, several dates can be entered for one activity). They consider it advantageous that freely selected headings can be used in a line schedule. They also consider important the possibility of using time step net plotting.

Thus far the System enterprise, reacting sensitively to the needs of users, has made minor changes in the program two or three times; documentation is

delivered in four volumes according to the CEMA standard. The price of the system includes 4 hours of instruction; usually this is organized in such a way that the first "live" task is worked out jointly with the user. The price of the HSZR-MICRO for an 8 bit machine is 80,000 forints, 120,000 forints for a 16 bit machine. If a user buys both versions the price is 160,000 forints.

We were happy to hear that talks are taking place to sign a contract for domestic SZM-4 applications and that it is the resolved intention of the enterprise to get onto foreign markets with the program product also.

8984
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EAST EUROPE/COMPUTERS

SHORTCOMINGS OF DOMESTIC MICROSOFTWARE PRODUCTION

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 5

[Article by Kovacs: "Microsoftware--Micromarket"]

[Text] A round-table debate organized by the Computer Applications Work Committee of the Organization Special Department of the SZVT [Scientific Society of Organization and Management] was held recently, with the participation of developers, vendors and users, to discuss domestic trade in microcomputer software products.

There is no doubt that one can find in our country many well-trained software development experts, some of whom can certainly hold their own even at the international level. It is also true that as a whole the experts, showing a great spread in regard to professional training, are not really efficient or effective. We do have trade in software, which sometimes takes place through the software merchants and sometimes through other channels. The various software meetings, exhibits and fairs are good initiatives. There are already comprehensive software catalogs, periodically brought up to date. The quality of documentation and the content of the prospectuses has improved recently. The small undertakings formed by the hundreds to deal in software have noticeably improved the domestic software offerings; their effect in bringing down prices somewhat and in creating a competition situation and their flexible, swift addressing and solving of problems can be observed. There is no disputing that the small organizations can solve very many partial tasks effectively and well. It is also a positive phenomenon that we are finding more and more shops selling software.

Despite all this the picture of the domestic software market is not at all rosy. Although the commodity nature of software has definitely strengthened, the supply is not yet satisfactory in quality, variety or quantity and it is out of proportion according to the individual applications areas. As a result of the uncoordinated situation the some 900-1,000 small and large organizations dealing with software development (or also dealing with it) which can be found in the country have created an over-supply of some products.

One of the chief obstacles to the development of trade is the large number of programs which are unique developments, satisfying special requirements, which

cannot be sold as commodities. Managing organizations and institutions today are becoming increasingly cost sensitive. As a result it is to be expected that there will be, instead of the expensive unique developments, an attempt to use or adapt the good bit cheaper commodity type software products which can be found on the market. With the "microcomputer flood" the growth rate of applications today is greater than that of the domestic software production capacity. And this increases the demand for widely applicable, good quality, commodity type products with a suitable service background. But if this is to happen this way many things must change. The first thing which must change is the low user culture, which manifests itself in, among other things, sticking rigidly to the accustomed and fearing adaptation. The present regulatory system and the frequent changes in it and the state support system do not favor a strengthening of the commodity character either. A unique development, tying down developmental capacity with one big order, is at present much more congenial for the software developers. There must be a gradual expansion of the market for mass selling ("off the shelf") software products, but in a way sympathetic to the users (let them see the product, try it out, possibly use a demonstration data carrier under their own conditions). The software products which can be developed en masse should be ones which will become finished goods in a short time and with less than 20 percent adaptation work--as known from international experiences.

There is a shortage of suitable, modern software development tools (hardware and software). With the aid of these one could react much more quickly to needs (including unique ones!) and could better assure tracking and adaptation. One can expect the developers to document the products clearly and understandably so that the "naive" user or business worker should understand them easily. Attention should also be given to seeing that software products are developed and traded primarily for those machines which are most used here at home. Commodity type software could further aid hardware and software compatibility.

We should create nonpartisan software consulting enterprises in our country which could recommend the best solution for the given task to the inexperienced users turning to them.

The creation of software publishing enterprises has begun but it should be urged more vigorously. In countries with a developed computer technology culture one can find such institutions in large numbers. They do not do the development work but rather test, survey the market and finance the work of the developers and conduct propagation activity. We could survey the market here too, find those areas in which software products could be sold in relatively large numbers. In addition, the publishing enterprises themselves could influence the developers.

On the domestic market also people should prepare to introduce products, constantly follow them and master business tricks (for example, selling new versions to users with the old version in such a way as to aid constant development). The vending of programs intended for professional users should be done one way and of those intended for "naive" users in another.

It would be useful to place greater emphasis on a public, comparative, critical analysis of software products in the professional press; there is a general need for all sorts of social feedback and the judgment of the market. Good advertising is very important in domestic software trade also. It should be recognized that this is a separate skill, and software advertisements and announcements will remain alarming as long as the computer technology and advertising experts do not take them in hand, as long as enterprise leaders are not inclined in many cases to accept the well intended recommendations of the advertising experts.

The profession must compete for users. The lack of confidence shown by the user society in regard to using finished programs could be decreased if these "trust" products precisely met the needs, if the products were reliable and if the organization selling them had references. The computer technology profession should strive to reach a higher level in the area of domestic applications, even as measured by international standards. There must be mass production of quality software products which do not presume computer technology traditions on the part of the users, do not presume the existence of experts who can well and quickly solve the enterprise software problems. It is necessary that some of the professionals should not suggest to leaders of enterprises (as they still do today) that their problems can be perfectly solved with home or game type small machines. Finally, the practice of "everyone dealing with everything" and the superfluous parallelism should be ended; the price of software products and services could be significantly decreased with much greater cooperation among the small and large organizations!

8984
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HUNGARIAN VARYTER-XT, IBM XT SELECTED FOR ACADEMY INSTITUTE RESEARCH

Budapest SZAMITASTECHNIKA in Hungarian No 2, Feb 86 p 2

[Article by Attila Kovacs: "Varyter-XT Computers in Basic Research"]

[Text] On a commission from the Computer Technology Applications Committee of the Hungarian Academy of Sciences experts have studied which devices in the 16 bit microcomputer category could and should be used in the network of the academy's research institutes or used in larger numbers. One of the two types recommended is the Varyter-XT personal computer of the COSY [Cooperative Systems] Technical Development Subsidiary of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] of which a significant number are going to the academy primarily as the basic machine for the basic research network for the purpose of supporting basic research. In 1985 they made 170 of these computers which will reach the various research sites by the end of the first quarter.

The Varyter-XT exhibits high level compatibility with the IBM PC/XT computer. The equipment will probably satisfy those parameters which one can expect from the 16 bit devices now standing at the world level, in regard to both reliability and expandability.

IBM Compatibility and Specialities

The chief characteristics of the Varyter-XT can be summed up as follows: the central unit contains an Intel 8088 microprocessor; the operational memory is 256-640 K bytes; it has a high resolution color or black and white display; it has two floppy disk drives according to the IBM standard; and it has a Winchester store (with a capacity of 10, 20, 30 or 40 M bytes).

The computer also has a few developmental achievements independent of the IBM PC/XT. For example, by pressing a key one can switch the keyboard back and forth from Hungarian to English. The so-called "video display card", in addition to controlling the color and black and white screen, makes it possible to change the screen operating mode, all the way up to a high resolution graphics mode. Another unique feature is the V-512 multi-function card which provides a perfect solution for those users whose basic configuration need is modest but who need the possibility of carrying out special functions.

The COBUS local network of the MTA SZTAKI makes it possible to connect the Varyter-XT into a network. Some of the computers, which are being constantly put into operation, are already working connected to the network in some academy research sites; in other institutes linking into the network is under way. The Varyter-XT computers are also being connected to the existing network of the academy.

Software Supply

The 16 bit personal computer works with the MS-DOS operating system; the COSY has purchased from the foreign shipper the right to use this only for this machine. Users can study virtually every more significant software product created in the world at a consulting and educational level in the software club established within the academy. The COSY has signed a contract with domestic software manufacturing and vending firms to jointly trade the products traded by them in the network of research sites. The goal of the COSY is to use as quickly as possible in the area of the academy the existing domestic software bases and capacities and their finished developments.

Instruction connected with the Varyter-XT has been organized at three levels. The internal academy instruction is organically connected with the MTA software club. There is also a software consulting service which can be reached by telephone. When finished software products are put into operation they employ outside experts in addition to those doing the adaptation.

The Varyter-XT was shown at the Software '86 exhibit held in November of last year. An opening to general users is the goal of the vendors in 1986. They want to do this in such a way as to work jointly with known domestic software development firms, undertaking to create and adapt software products. The Varyter-XT will probably be used in domestic institutions of higher learning also.

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EAST EUROPE/ELECTRICAL SYSTEMS

DEVELOPMENT OF POLISH RADAR DESCRIBED

Warsaw HORYZONTY TECHNIKI in Polish No 2, Feb 86 pp 15-17

[Article by Tadeusz Napierata: "Polish Radar"]

[Excerpts] In 1956 a design bureau was created at the Rawar Warsaw Radio Factory to work exclusively on the design of marine navigation radar. In 1958 the prototype of RLM61 radar was developed, which in 1959 was brought to the market in two versions: RLM61a and RLM61b. These radars, however, were inferior in quality and technical parameters to many of the foreign products. Later, radars RN221 and RN222 were developed, which were manufactured until 1965, when RN231 was launched (this was the last radar of the first generation which can be described the last "tube" radar).

In 1970 a new series of radars, TRN [transistor navigation radars], was started, opening the second "transistor" generation of radars. Of the three indicators, two types of transmitters of four types of antennas, eight variations of radars were built at that time.

Later, TRN823 radar was created, which had already two indicators: the main and secondary indicators. Shortly after that, the third generation of radars appeared on the drawing board: "integrated" navigation radars of the SRN series, which used integrated digital circuits. The production of these radars was started in 1974. Initially, this group included SRN623 and SRN624, as well as SRN301 and SRN302. Later, yacht radars SRN206 and radars for small boats (cutters and tugboats) SRN207 were built, as well as radars of the SRN700 series for larger ships. Currently, the fourth generation is being developed: these are the navigation radars of the series SRN400, which are built around a microprocessor.

Semiconductor Radars

The introduction of semiconductor elements into radars meant the creation of a new generation of this equipment. Semiconductors made it possible to greatly reduce the size of the radar, its weight and power demand, and, at the same time, greatly improve its operation reliability. The radars of the TRN series were the first to use standardized modules. As a result, eight types of radars were built; in their code designations (e.g., TRN524) the first digit defines the type of indicator, the second the type of trans-

mitter and the third the type of antenna. This notation was adopted also for subsequent radars. The antennas differed in the size of the span (from 1390 to 3650 mm), the horizontal beam width (from 1.8 to 0.7°) and the vertical beam width (30 and 22°). All operated on a wavelength of 3 cm, with horizontal polarization, since reflection from the sea surface in that case is much smaller than with vertical polarization. On indicators of the type 3-5, the image was relative, oriented by the course or the north, and in indicator type 5, in addition, an actual image was formed, which made it possible to distinguish on the screen the echo from moving objects and that from stationary ones. The moving objects on this indicator produced a fuzzy echo with a characteristic tail. As a result, it was possible to determine the direction of their movement. The actual image was obtained by feeding into a special attachment the data from gyrocompass and the log.

All the radars of the TRN series were equipped with a power monitor installed on a reducer on the ship mast, which controlled the operation of the receiver, the antenna and the waveguide line, and also the echo resonator controlling the operation of the transmitter-receiver system.

The radars of the TRN300 series were intended for smaller vessels, TRN400 for medium-sized vessels and TRN500 for larger ships.

Radars on Integrated Circuits

In navigation radars SRN (on integrated circuits), the isolated semiconductor elements were replaced by assemblies in the form of integrated circuits. The first units of the third generation were the radars SRN623 and SRN624, which also used a new indicator and modernized transmitter and antenna. They were intended for larger vessels, and for that reason, in addition to the power monitor and echo resonator, had a special attachment for radar drawings (so-called nonparallactic attachment). It draws easily erasable symbols and lines which appear similar to the image on an indicator screen. The new indicator was furnished with a radaroscope lamp of a diameter of 40.6 cm with eight observation ranges: from 0.5 to 60 nautical miles. The image on the indicator could be relative, oriented by the course or the north, or actual in ranges from 0.75 to 12 nautical miles.

The next radars of the third generation, intended for smaller vessels, were SRN301 and SRN302. The transmitter, combined with the feeder and receiver units, was no longer built as a separate bloc, but placed together with the antenna on the mast. This made it possible to eliminate the waveguide line, which sent the electromagnetic pulses to the antenna, and reduced the transmitter power to 3 kW, as well as reducing the dimensions and the weight of the transmitter unit.

Starting from the radars SRN300, the modulator of a new design began to be used in the transmitter: in the smaller radars it was a line-thyristor transmitter and in large units a thyristor-magnetic transmitter.

Instead of SRN600 radars, the series SRN700, which, by its technological parameters and operational reliability, is among the best in the world, was produced. The antennas of SRN700 radars can operate in the wavelength band of 3 or 10 cm. The 10-cm band features a high resistance to noise caused by atmospheric precipitation; however, the antennas operating in this band are large in size. The design of the radars makes it possible to build radar systems by connecting two units in a commutative mode in these assemblies: 3-cm radar — 3-cm radar; 10-cm radar — 3-cm radar; and 10-cm radar — 10-cm radio.

Radars of the Fourth Generation

This generation of radars is still being created. It is known that they will utilize modernized transmitters of SRN300 and SRN700 radars, as well as a new indicator which was exhibited at the Poznan International Fair in 1985. This indicator has a movable attachment and can be set at different angles. The built-in microprocesses MCY7880 performs the following functions in the radar: feeds relative and actual images and anticollision drawings and computes the necessary input data for angular and distance measurements. The anticollision drawings serve to detect the collision courses of objects observed in the indicator in the echo form. The drawings are formed on the radar screen as radial segments, which can be moved by the operator. The movement of the echo relative to the drawing indicates whether the object is on a collision course or not. In the radar group SRN400, hand-held radars are also being developed which are as yet not manufactured in Poland.

There is no doubt that in the future Polish radars will use indicators with color screens of the monitor type, which are already produced in the country. Research on electronic circuits for such tubes is already being conducted. As Polish electronics develops, large-scale integration circuits will be used in radars, which will make it possible to further reduce the weight and size of the units and improve their reliability. There are also plans for expanding the functions of the radars, including the supplies of additional navigational data in a ready-to-use form in order to limit the role of human operators in the man-radar system as much as possible, so as to reduce the chance of faulty interpretation.

Today, on new aircraft and also on large supertankers, so-called integrated navigation indicators are already being used. They display on a color monitor not only the image of the navigation radar but also utilize the data on the position and course of all objects in the environment to project their probable position in the immediate future. The screens of these radars also project images of the weather situation. The indicator precision of these radars has been improving; they make it possible to locate an object with an accuracy of up to several centimeters, and maybe the radars as we know them will disappear, to be replaced by lasers, which are smaller and much more accurate. For this solution, we will have to wait with patience.

9922
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LASER APPLICATIONS IN GDR, OTHER COUNTRIES

Patent Activities

East Berlin TECHNISCHE GEMEINSCHAFT in German No 3, 1986 pp 13-14

[Article by Dr W. Bonk, GDR Invention and Patent Office: "Inventors Are Placing Their Hopes in This new Tool"]

> [Text] The laser, so called after the initial letters of its short definition--light amplification by stimulated emission of radiation--has been inducing many inventors to apply for patents pertaining to this, with its manifold possibilities for an efficient working of materials. Our author considers the application of laser technology as reflected in the patent literature.

A high power density, an only slight warming outside the machining zone, a low requirement for filler metal, a low-contamination production method, no or only slight refinishing work needed on the areas of cut, a good capacity for automation, and considerable flexibility are potential advantages of the laser "tool"--advantages that are gaining recognition in automated machining facilities.

With lasers, cutting speeds can be increased substantially, materials that are difficult to machine can be worked, materials that resist welding treatment can be bonded, very small holes can be made, and selected subdomains of workpieces can be hardened. With nearly all machining processes, the gain in time frequently amounts to several hundred percent.

Patent Literature Shows an Increase

Toward the end of the 1970's, the practical possibilities for the working of materials increased with the development of high-power lasers in the kilowatt range. This is also reflected in the patent literature. Patent searches in the GDR, the FRG, the USSR, the United States, and inquiries using the resources of the (West) European Patent Convention (EPUe) as well as the International Patent Agreement (PCT) have revealed for the period between 1 January 1970 (application date) to 15 August 1985 (date of patent issue) a total of 442 invention specifications relevant to the working of

materials using lasers. When these 15 years are subdivided into 5-year periods, the increasing momentum in this field is striking.

Some results of other statistical investigations, for example in connection with invention specifications concerning cutting processes, are that almost half of the laser systems based on such inventions involves the machining of metal plates. Likewise, a differentiation in the materials dealt with can be seen. In this connection, metal ranks before textiles and glass/ceramics. It can also be established that many of the patent applications of some patent holders (for example Siemens AG of the FRG, or United Technologies Corporation of the United States) are for patents involving a number of machining processes at once, whereas other firms are concentrating only on one process. From such distributions of types of patents, conclusions can be drawn concerning what is being emphasized in research and development activity.

Developmental Trend: Combined Processes

When these 440 patent applications are subjected to a close analysis, an interesting pattern emerges. Whereas in the 1970's the subject matter of such invention specifications was above all the development of individual components of a laser machining facility and their reliable functioning, in the 1980's a clear trend in the following directions has emerged:

- Automation of the laser machining equipment,

- A combining of laser technology with other material-working processes,

- A raising of the efficiency and range of performance of laser machining equipment.

Photoelectric Detectors Optimize Focusing

The automating of laser machining equipment is useful above all when it is integrated in mass-production processes and specifically in flexible automated production systems. Here the use of photodetectors for controlling and monitoring the laser machining occupies a prominent position.

Photodetector control units are used both for positioning the laser beam at the (marked) machining point, and also for controlling the machining path and the pace or intensity of machining. Besides positioning and the control of machining intensity, photodetectors are also used for automatic focus control. In other cases, simpler and cheaper mechanical sensing systems are also being proposed for spacing control. On the basis of such inventions, it proves possible to use such photodetector control units in an integrated system, for example in a welding cell using a rotary indexing table, in belt conveyors, or in an industrial robot.

Other solutions for the positioning of the laser are provided for by the use of the CNC [computerized numerical control] technique known from machine-tool building, or by the utilization of a hologram of desired shape

for position control. In order to achieve a comprehensive automation, some patents specify solutions for the automatic and separate removal of the machining-finished workpieces, as well as of waste matter consisting of powder and gases.

From patents of firms in the United States, Japan, Great Britain, and the FRG, it can be seen that in the working of materials, significant increases in productivity and quality can be achieved by combining laser technology with other machining methods. Thus, for example, proposals are being made involving a combination of cutting work on a lathe with a simultaneous laser action upon the cutting site, or the combination of a saw with a laser, or of lasers and electric arcs or lasers and electron beams. Efficiency-increasing effects are being produced also in sheet-metal working by way of a simultaneous punching and laser cutting, in shaping work by way of milling and three-dimensional laser cutting, and in machining of a press roll within a chuck device by way of turning and a subsequent laser engraving.

Universal Tool Awaits Users

Another series of patents concerns raising the efficiency and performance range of the laser-working process itself. To this end, some of the proposals are the use of flexible fiber-optic cables both for the laser guidance and for regulating focus and radiation intensity, the simultaneous internal and external welding of pipes by the method of laser-beam splitting, the coupling of laser work with ultrasound (better diffusion and homogeneity of the melt), and the feeding of exothermic gas mixtures or directed gas jets for increasing performance.

An improvement in the surface quality of the machined workpieces (especially in connection with hardening) through a more uniform radiation-density distribution in the laser beam is said to be made possible by using adjustable mirror and lens systems, swiveling reflective surfaces, and rotating mirrors. Aside from the three developmental trends mentioned concerning automation and raising productivity, yet other focal points of inventor activity are appearing in the various methods for the working of materials using lasers.

- Cutting: Positioning of workpiece and laser head, beam guidance and flush-gas guidance.

- Welding: Bonding of special materials (copper-aluminum, copper-iron, glass fibers).

- Material removal: Engraving (printing-plate manufacture, marking, inscribing, decorating of glass, ceramics, gems). Balancing of rotor wheels, removal of the insulation from cables, deburring, derusting, or descaling.

- Coating: Exclusively metallizing (fusing of powder).

- Perforating: Technologies that are geared to certain materials and workpieces (a notable patent-application activity only since 1979).

- Boring: Preheating of the machining sites, pressurized-gas guidance, special boring technologies.

- Other: Remelting of a surface, drying, baking of refractory material.

Half of the patent applications from the GDR concerns cutting, and prior to 1980 these originated above all at ZIS [Central Institute for Welding Technology], Halle. Towards the end of the 1970's and above all in the 1980's, research activity has been broader; inventions have appeared on welding, material removal, hardening, and on general problems of laser machining, with in fact the bulk of these coming from institutions of the Academy of Sciences and from universities and technical schools. In order to keep to the indicated developmental trends on automation and raising productivity, in the future it is essential to direct research and development work in the GDR even more toward more highly efficient laser techniques and equipment.

Interview with Laser Specialist

East Berlin TECHNISCHE GEMEINSCHAFT in German No 3, 1980 p 14

[Interview with Dr Hartmut Mueller, head of the Working Group on Laser Technology, by Dr E. Junger]

> [Text] The Working Group (AG) on Laser Technology established in December 1985 [sic] (see TECHNISCHE GEMEINSCHAFT, 2/1984, p 24) had set itself the task, among other things, of supporting industrial enterprises to prepare for laser applications. The leader of this AG, Dr Hartmut Mueller of Friedrich Schiller University at Jena, answers questions about the results of its work.

[Question] The AG on Laser Technology has been around for 2 years now. What have you accomplished?

[Answer] This working group is a body from the scientific section on manufacturing process design in the Machine-building Industrial Association. Its establishment is the result of the needed development of laser engineering into a production technology that can be applied in industry. Today, 59 members from 43 enterprises and 16 academy, university, and technical-school institutions as well as research institutions are associated in this working group. A managing board for the AG has been formed, composed of its most experienced representatives--members who are working in laser application centers and laser-equipment manufacturing enterprises.

Our future task lies in the further research, development, and introduction into production of laser devices, positioning equipment, and auxiliary

equipment--that is, of "laser machinery" for a great variety of applications.

[Question] Can you mention some examples of applications?

[Answer] Jointly with Microphone Technology VEB of Gefell and users such as the Tool Combine of Schmalkalden, the physics and technology sections have developed and put into production a YAG [yttrium-aluminum-garnet] laser for the inscribing of workpieces.

At the Packaging Materials Factory VEB of Saalfeld, with the cooperation of the AG a solution to the cutting of strip steel has been developed.

Tasks involving the use of laser technology for hardening materials are being worked on primarily at the Central Institute for Solid-state Physics and Materials Research. At the RAW VEB of Cottbus, the AG has assisted in the introduction into production of one solution to this problem.

Investigations on the range of required components and information on components specific to lasers in manufacturing are important prerequisites for further introductions into production.

[Question] But does not the impact of your working group extend even further?

[Answer] Starting with the objective of conveying our experience and knowledge to industry, we now have concrete results. One high point up to now has been the Jena Engineering Conference in April 1985, which was co-organized by the AG. The theme of this conference was "Laser Technology." Here, 250 representatives of a great variety of fields discussed questions of laser applications. It has proved possible to achieve economically effective results above all through the following activities:

- Advice on the application of laser engineering
- Information on required manufacturing capacities for prototype components
- Technological consultations
- Support for enterprises that are preparing to use laser technology.

Through this activity by the working group, enterprises have saved time and made well-informed decisions in preparing for the use and application of laser engineering.

[Question] What focal points for your future work do you see?

[Answer] The activity of the Working Group on Laser Technology is to be seen in the further continuation of exchanges of experience. This includes the generalizing of solutions, making contacts, and further extending interdisciplinary cooperation.

Concrete steps being taken are the obligations entered into by many institutions to follow the "KDT [Chamber of Technology] Initiative of the XI Party Congress" and to fulfill this at a very high qualitative level, such as is happening at the Weimar Works VEB. Other concrete tasks lie in the elaboration of KDT guidelines on the use of lasers and in the establishment of a "laser technology" information system.

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EAST EUROPE/MICROELECTRONICS

MAGYAR ELEKTRONIKA, TABLE OF CONTENTS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 5, 1985 pp 2-3

On Our Cover

On our cover one can see the emblem of the Software '86 exhibit. At the 4 day exhibit to be held in November--at the Hotel Duna Intercontinental--the COMPORGAN Systems House Joint Enterprise, as organizer, will seek an answer to the question: Is Software a Commodity in Hungary? "The basic goal of the exhibit is to acquaint the visitors with the work of the various enterprises, GMK's [business partnerships] and cooperatives, inform them about their new products, and win their confidence so that they will become purchasers of their products." MAGYAR ELEKTRONIKA is helping in its own way to achieve this goal; it is publishing articles and product descriptions from those who answered our appeal.

Software

In our Software column one can find those professional articles which give examples of the many-sided use of computer technology. It is a common characteristic of the articles that they try to make the computer solution of some problem attractive primarily to those who must solve some task in practice with a computer.

The computer linking of places of work will be an ever more significant task in our country too. It cannot be hoped that local networks will be made up of microcomputers and one or more large computers. The people at Videoton describe their network, organized from VT-32 computers, in their article titled "The EXLOC Local Network." The network, based on the newest microcomputer of Videoton and on its UNIX-compatible operating system, can be used on every computer as if the user were working in a single computer environment; at the same time it can free significant background storage capacity.

The FRAME applications-development framework system offers a software preparation possibility for those programmers who solve tasks of the same sort many times. Using the framework system makes it possible to constantly reduce program preparation time, and mastering it requires only a few days.

The people at the KFKI [Central Physics Research Institute] appear in our software issue with two articles. The TRACCS-11 transaction processing system was prepared for their TPA megamini computers. The operating system is supplemented by a data transmission program package serving a large number of remote terminals, by a database manager and by other functions. The SZOFI text processing program system was prepared for the TPA QUADRO microcomputer. The text editing programs, spreading more and more recently, serve to facilitate and modernize office work. The SZOFI text editor makes it possible for even an operator not versed in computer technology to quickly learn its operation and make-up on the screen.

Peter Gero and Tibor Bodor describe a user development system. The developers describe their structure translating program, prepared for small capacity microcomputers, illustrating it with an example.

Hobbytronics

In our column called Hobbytronics we conclude the series by David Ada-Winter on machine code programming of the ZX Spectrum. We would be pleased if those of our readers versed in the various applications of home computers (measurement, control, testing) would appear as authors and aid with their ideas a use of microcomputers which goes beyond games. This would be the primary goal in our Hobbytronics column, but we feel that articles dealing with microcomputer peripherals, including the fabrication of measurment transformers and small robots, would not be out of place here either.

Interfaces

From time to time our Interfaces column tries to provide news about new development results and manufacturing and commercial items of interest. We call the attention of all those interested to the fact that publication in this column is free of charge; at the same time, we do not publish detailed technical data or commercial information. Such items can be published in our New Products column--very cheaply.

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EXLOC LOCAL NETWORK SUPPORTS OFFICE AUTOMATION

Budapest MAGYAR ELEKTRONIKA in Hungarian No 5, 1985 pp 14-19

[Article by Andras Balazs, Marton Gall, Rudolf Jakfalvi, Mrs Karoly Paulinszky, Peter Sugar and Janos Szentner: "The EXLOC Local Network"]

[Text] Our article describes a local area network called EXLOC which Videoton developed to support distributed processing, office automation and CAD/CAM. The EXLOC system is based on Videoton's newest microcomputer, the VT-32, and on its UNIX-compatible operating system. In our article we describe the basic goals and concepts of our network and then write about experiences and future plans.

Introduction

The primary goal of the EXLOC (Experimental Local Area Network) system is to link Videoton's VT-32 microcomputers. Although the name of the network reflects our original experimental plans it has already grown to be a true product. In what follows we describe the viewpoints and requirements of the development, the goals and properties of the network and our further ideas.

Goals

a. A high-speed link among VT-32 computers at a small distance from one another:

The VT-32 is a 16/32 bit microcomputer. Its operating system is the uSOS, which has a UNIX-V7-compatible interface. Thus, in theory, one could run on the VT-32 all applications programs based on UNIX-V7. Since the VT-32 was made to support office automation and CAD/CAM applications, in addition to the customary uSOS/UNIX applications, it seemed must useful to supplement it from the data transmission viewpoint by realizing high-speed, small-distance data transmission.

b. Applications programs unchanged:

We think that in addition to distributing the resources in the network this is one of the greatest advantages for users of the network. This means that one need not rewrite those programs which will run on a stand-alone computer

because of the new network environment. The interfaces remain the old interfaces and the applications programs need not deal with whether they are running on a single computer or in a network environment with a distribution of resources which may affect them.

c. Unchanged in regard to the kernel:

This means that in theory a possible modification of the uSOS (UNIX) kernel (the memory-resident part of the operating system) will not require a change in the network software. In this way one can realize a certain level of portability of the network software into another environment.

d. Simple modification and expansion of the network in regard to number of computers linked and the data transmission medium.

The EXLOC Solution

We proceeded according to the following viewpoints in order to satisfy the requirements detailed above:

a. We selected the Ethernet local network solution for high-speed, small-distance data transmission. This is especially suitable for office and CAD/CAM applications, it is well standardized, and there are integrated circuits available to run it, circuits manufactured by a number of suppliers.

b. Starting from the uSOS/UNIX environment it seemed proper to follow the UNIX conception; that is, "See the world as UNIX sees it!" We will express this in more detail in the next section.

c. Since the applications programs are unchanged the network software contains the highest level protocols as well. Considering the scanty data transmission possibilities of UNIX-V7 among processes we deviated from many other network designs by not wanting to realize general and complete data transmission among processes spread along the network. Instead we introduced a network catalog tree and a network file concept, thus taking over the elegance and generality of the UNIX file concept. UNIX treats all types of resources (files, programs and I/O devices) as files and provides the same mechanisms to access them. Thus UNIX--because of its internal operation--offers a certain level of immutability for applications programs. The UNIX file catalog has a tree structure; it starts from a root catalog and can contain numerous subcatalogs (nonterminal) and files (as letters). Starting from the current or root catalog one can reach every catalog and file by knowing the access name and following it to the end. In the network we imagined the network catalog tree as a union of the catalog trees existing in the various computers, and we introduced a special network root catalog. The subcatalogs of the new root are all the previous catalogs which previously were root catalogs on a single machine. These special catalogs represent the machines linked into the network. In this way every single file (resource) in the network can be accessed for any applications process running in the network just as in a single computer environment. The only difference will be that the access name of the file will pertain to the entire network catalog tree.

d. In the interest of being independent of the kernel we decided that we should realize the largest part of the EXLOC software outside the kernel as a user level process. In reality these are new UNIX commands or programs, so even at this point we accomodated to the UNIX concept.

e. We developed the network for a layered structure in accordance with the ISO-OSI Reference Model. When developing the network layer we followed the appropriate protocol of the Xerox Network System (XNS), with some simplification of the protocol. The protocols representing the transport and session layers are efficient, fast programs exploiting local network operation. In the future other, new protocols can be used in addition to these.

Building Up the Network

The global file access protocol (GFAP) manages the network catalog tree. It registers all the file access commands of the applications programs. In the event of an "open" file system call it decides whether the file sought is on a local or remote machine. If it is local then the GFAP transfers the call to the local kernel; otherwise it makes contact with the appropriate remote GFAP process, which accepts all those file access commands which pertain to the local files for it. During normal resource use the GFAP is responsible for the harmony of the file system; it must recognize the disappearance of a partner and must handle such and similar events.

The Service Connection Protocol (the level in the EXLOC corresponding to the OSI relationship layer) controls data transmission among processes wanting to use a remote resource and the processes providing use of the resource. In general we conceive of the EXLOC network as a set of the various services located in the network, such as printing, file access, etc., and a set of users. The service watching process (SFP) represents a definite service on one machine. An SFP can write and can erase the service belonging to it from the network service administration, which is itself a service. After the SFP has opened a service on a local machine it can receive the "connect to provider" request pertaining to the given service. If it receives it the SFP creates a provider process which represents the given remote user on the local machine. After this use of the service is realized via the new user-provider link. After execution the provider process ends.

The Reliable Datagram Transport Protocol (MDTP), like the XNS Sequenced Packet Protocol, guarantees the error-free and correctly sequenced transmission of data packets in addition to protecting against duplicated packets or those not coming from the proper source. It makes up longer messages into 543 byte packets and controls the data process. Since it does not deal with links it can be regarded as an acknowledged protocol, without a link.

The Internetwork Datagram Protocol (IDP) is a slightly reduced version of the corresponding XNS protocol. Its functions include addressing, routing and forwarding standard Internet packets. When forwarding it is not certain that the sent packets will really arrive or will arrive only once or will stay in sequence. The standard XNS IDP packet format is used, making use of a triple network address (network address 32 bits, station address 48 bits and processor address within a station 16 bits).

The several processes can be sent to or received from the same address. The addresses of the service watching processes are recognized throughout the network.

The two lower level protocols of the network (the physical and data link levels) are realized by a VT-32 single card Ethernet interface, which we describe below.

The VT-32 Local Network Hardware

The VT-32 local network coupling unit, supplemented by a transmitting-receiving unit, is a complete solution realizing the prescriptions pertaining to the physical and data link layers of Ethernet, thus with the aid of the coupling unit the VT-32, with the appropriate software, is suitable for local network operation.

In the coupling unit there is a memory made up of dynamic RAMs; the memory capacity is 64 K words. This memory can be accessed by the CPU through the VME bus and by the Ethernet control logic. The Ethernet control logic puts frames arriving over the coaxial cable into this memory (from which the software managing the local network forwards them to higher layers at a moment suitable for it); frames to be forwarded over the coaxial cable are also put into this memory.

The dynamic RAM control logic not only refreshes the dynamic RAMS but also provides two-way access to the memory.

The VME interface logic provides two-way data traffic (read-write) between the CPU and the coupling unit.

The Ethernet data link control logic meets the IEEE 802.3 specifications and provides the CSMA/CD access mode. It consists of two chief parts--a control unit and a receiving unit. The CPU asks the control unit to perform the appropriate operation (transmission, reception, etc.) with one command, upon which the control unit answers by transmitting an interrupt. The CPU must acknowledge this latter by issuing a new command.

The control unit of the Ethernet control logic can execute the commands issued by the CPU and it handles transmission of the frames. The receiving unit takes care of receiving the frames (storage, recognizing addresses, CRC check). The CPU controls and checks the two units via a table system, which is placed in

the memory of the coupling unit. Every logical link between the CPU and the Ethernet control logic is realized through this table system. Two additional table systems are used to record commands and indicate the storage areas of frames received.

The Ethernet control logic produces the station addresses in addition to the 6 byte address recognition; and it produces and checks the 32 bit CRC. It executes the prescribed number of repeats after a conflict. The length of the waiting time between repeats is random and the values to be expected increase with the number of repeats (Binary Exponential Backoff).

It is capable of executing diagnostic commands; it can identify internal failures of the control and failures in the coaxial cable. It is also capable of keeping error statistics regarding both transmitted and received frames.

The sequential data appearing at the output of the Ethernet control logic are transformed by the transceiver interface logic into a form suitable for the transceiver unit.

The tasks of the transceiver interface logic are: Manchester coding/decoding, resetting the reception clock signal, producing the transmission clock signal and transforming the TTL-ECL level.

Considering the complexity of the coupling unit there are a number of possibilities for tuning and testing it:

--Looping the Ethernet control logic back by eliminating the transceiver unit and the transceiver interface logic, the so-called loop test;

--Looping back through the transceiver interface logic by a "loop-back" command issued by software, which tests the transceiver interface logic too;

--Looping back through the transceiver unit (receiving information sent out to the coaxial cable), the so-called external loop test.

Experiences

Our first system was in an experimental phase in 1984. We linked three VT-32 computers with a coaxial cable 25 meters long. All three VT-32's had interactive terminals and floppy disks or Winchester disks. In the first phase we realized only the global file access protocol because first we wanted to guarantee the immutability of the applications programs in the uSOS/UNIX environment. The network administration service and the IDP routing functions were realized only at a minimal level.

The network software requires an average of 60-70 K bytes of memory, but the size depends on the number of user-provider links and services. At present we are dealing with networking the interactive command interpretation program (shell) of the operating system and other applications programs (utilities). This is possible because these programs run as user level processes. By adapting the command interpreter we can ensure that if the user wants to handle file A with program B and send the result to file C then he need not

know where files A and C are or where program B will run; he will not even know whether he is working in a network. The user must be able to put his commands in at the terminal as in a one-computer environment. The possibility for remote execution of a program is also advantageous because this makes it possible for only one copy of the system programs to exist in the network, and this frees a significant quantity of disk capacity. Since most UNIX systems, together with their system programs, require about 8 M bytes of disk space keeping 80 percent of the programs on one machine in a 20 machine system can free 128 M bytes of disk space.

In order to expand the sphere of network applications an Electronic Correspondence Service has been prepared for the EXLOC network. In a few respects this follows the CCITT MHS standard. This also is a one-machine program which can be used on a single machine or in a multimachine network environment.

Future Plans

In the interest of increasing efficiency and reducing the network operation burdening the uSOS operating system we are designing a programmable Ethernet "front-end" control which will realize the largest part of the protocol layers. Our more immediate plans include fitting a Videoton R11 megamini computer into the network. Several new services are under development, such as an IBM 3274 terminal emulation service with the aid of which one could access large computers from the network.

Autobiographic Notes

Andras Balazs: I graduated in 1971 from the Janos Apaczai Csere training gymnazium of the Lorand Eotvos Science University. I obtained my electrical engineering degree in the instruments and control technology section of the Budapest Technical University in 1976. Between 1976 and 1978 I participated in day engineering training at the Instrumentation and Metrology Faculty on a scholarship of the Videoton Computer Technology Factory. My theme was microcomputer processing of electronic signals. My university doctor's thesis was on this too. I defended my thesis in 1981. Since 1978 I have been working on developments connected with computer networks in the data transmission department of the Videoton Developmental Institute. In the EXLOC project my task is realization of network file access; I am also responsible for implementation of the theme. I spend my free time with my family and friends. I have no special hobbies.

Marton Gall: I graduated from the Electrical Engineering School of the Budapest Technical University in 1980 and then participated in day engineering training at the Instrumentation and Metrology Faculty of the Budapest Technical University, dealing with the testing of complex circuits. At present I am developing the software for the EXLOC local network in the Videoton Developmental Institute. I am married and have one son. In my free time I listen to music and surf.

Rudolf Jakfalvi: I was born on 7 May 1956 in Szombathely. I finished secondary school there, at the Lajos Nagy Gymnazium, from which I was admitted to the Electrical Engineering School of the Budapest Technical University. I obtained my electrical engineering degree in 1980 and for 2 years participated in day engineering training at the Instrumentation and Metrology Faculty of the Budapest Technical University as a worker for the Videoton Developmental Institute. My theme was a study of the performance capabilities of time-sharing operating systems. Since 1982 my task at Videoton has been software for the lower two layers of the EXLOC 2.1 architecture and I was one of the leaders of the EXLOC project. Since the beginning of 1984 I have been group chief for the local network group. I am married and have a little boy three and a half years old. In my free time I like to read, go on excursions, listen to music and go to the theater and movies.

Mrs Karoly Paulinszky: I graduated in the Instrument and Control Technology section of the Electrical Engineering School of the Budapest Technical University in 1969. In 1969 I was placed as a scientific assistant at the Electronics and Precision Engineering Research Institute where I was promoted to scientific colleague in 1971. At present I am working as a developmental engineer at the Videoton Developmental Institute, the legal successor to the Electronics and Precision Engineering Research Institute. My work has been connected with development of the data transmission couplings for the VT 1010B, ESZ 1010, VT 1005 and ESZ 1011 and with development and international certification of the AP-50 intelligent terminal. Most recently I participated in development of the VT 32 local network coupling hardware. My hobbies--sewing, reading, theater--are time consuming so I have very little free time.

Peter Sugar: I was born in 1947. I graduated from the Electrical Engineering School of the Budapest Technical University in 1970. I have worked at the Videoton Developmental Institute since 1972. In 1975 I developed an operating system for a programmed multiplexer based on the R10 and designed the software for it. I prepared for the introduction of structured programming. In 1979-1980, at the invitation and under the direction of Professor Mischa Schwartz, I dealt with research on network operating systems at Columbia University in New York, as a scholarship graduate student. Prior to this I did similar research at University College London. I defended my candidate's dissertation on the theme in 1981. Between 1981 and 1983 I led the software project for a transaction communications system for a back-end computer based on the R11 being prepared for a French firm. Since 1983 I have guided the Videoton local network project (EXLOC). I participate as the Hungarian member in the work of an ISO work group dealing with standardization of local networks.

Janos Szentner: I was born in 1956 in Tarjan. I obtained my electrical engineering degree in 1981 at the Budapest Technical University; then for 2 years I participated in day engineering training. Within this framework I began to deal with computer networks. I defended my special engineering degree in 1985. Since 1981 I have been working at the Videoton Developmental Institute where I participate primarily in development of EXLOC local network software. I am married and have one son. I spend my free time primarily with my family, but I like sports and also like to meet with my friends.

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TRACCS-11 TRANSACTION PROCESSING SYSTEM

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[Article by Agnes Szigeti and Pal Karadi: "The TRACCS-11 Transaction Processing System"]

[Text] Following a review of the requirements for online transaction processing the article describes the software and hardware architecture of transaction processing systems based on the TPA megamini.

The development of microelectronics in the category (price level) of minicomputers resulted at the turn of the decade in the appearance of the so-called megaminis. These make possible the management of internal storage capacity (several M bytes), magnetic disk capacity (several hundred M bytes) and numbers of terminals (several dozen) greater by approximately an order of magnitude compared to the minicomputers of the 1970's. The assortment of software tools for minicomputers (realtime operating systems, index sequential file handlers, online data input/data transmission emulators) has, adjusting to the new hardware conditions, been expanded by database management systems, "large" linguistic processors and network management software. This computer technology "armory" now contains every element needed to create online transaction processing systems.

Online transaction processing systems must offer management work sites realtime data recording, processing and information services. Those participating in the work process control the computer processing by executing every management event (transaction) using terminals located at the management work site and at the time of their creation the data of the transactions immediately and completely (together with their consequences) enter a database extending to the work process as a whole. The decisions and transactions of the management personnel are born making use of the realtime information which can be obtained from this database.

The potential applications area of this computerized task processing schema is very broad; it can be used effectively in warehouse, production control, banking, commercial and reservations work processes.

But the obvious advantages of online transaction processing systems can be exploited only at the price of satisfying a most complex computer technology requirements system. Functionally one must see to it that various operations can be carried out from a common database in a random distribution from a large number of terminals scattered over a large area. The system must operate with very great reliability and with a toleration of errors, and the response times must move among the (narrow) limits acceptable to humans, even with a load which varies between broad limits.

In what follows we describe the software and hardware tools of online transaction processing systems based on a TPA megamini aimed at satisfying the requirements outlined.

The TRACCS-11 Program System

The TRACCS-11 is a program system based on the DOS-RV operating system expanded by transaction processing services. The TRACCS-11 supplements the operating system with a remote data transmission program package serving a large number of remote terminals, with a database management system and with other resource management functions. By using this expanded software system complex transaction processing tasks can be solved easily and quickly, within uniform and well defined limits, by small size transaction "tasks" written in high level languages (COBOL, FORTRAN, BASIC PLUS-2), and the system can be changed flexibly as the applications needs change. Figure 1 shows the structure and environment of the TRACCS-11.

The terminal manager takes care of the tasks of message transmission and network control in the communications system. The messages arrive from the terminals in the form of physical blocks, the terminal manager converts the physical blocks into an internal code and formulates the logical message. It forms into physical blocks the messages generated by user programs which are going to the terminal, produces the appropriate line code and passes them on via the data transmission lines. In the event of line and other network errors it automatically provides block repetition.

The transaction management module is the most important part of the system. It guides the messages among the terminals and various user tasks, it starts or stops the appropriate tasks, and passes on the messages sent to and by it to the various terminals or tasks. The transaction manager constitutes the interface between the user environment and the terminal control.

The screen manager offers a device-independent screen management possibility for the writing of user programs. The format to be presented on the screen can be defined with the aid of a format description language, the formats created can be placed in a library and can be built into the user programs. The terminal management, transaction management and screen management modules form the communications subsystem (DC) of the TRACCS-11 system. The communications subsystem operates in the so-called message controlled mode, which means that

in the life of the system the arrival of messages activates the various functions, and the message is the smallest unit for the movement of data. This solution deviates from the "character principle" terminal management method of DOS-RV and significantly improves the through-put capability of the entire system.

The database management subsystem (DB) serves online management of large volumes of data. In general in transaction processing tasks one must define complex data connections and many "tasks" not synchronized with one another use the same data at the same time. The database manager is capable of handling complex tree and net type structures. The tree structure is a hierarchic ordering of various types of records. Zero or several "member" record types can belong to every record type, and can be a derivative of only one "owner" record type. The records can be retrieved according to a symbolic key and/or on the basis of the logical link within the hierarchy. A number of tree structures can be absorbed in a net structure; that is, a given record type can belong to one or more "owner" record types, if the given record type is part of several tree structures.

The relations among the records can be indexed, "hash" indexed or chained, which offers great flexibility for the logical definition of the database. The operations pertaining to records in the database, such as expansion, query, change or erase, can be executed by means of simple instructions such as "add", "get", "get next", "connect", etc. The database manager offers CODASYL support at the record level. With record-level closing and freeing operations the integrity of the database is automatic and there is a simultaneous access possibility for a number of "tasks."

Physically the various record types participating in the database are placed in files. The database manager offers the possibility for individual files to go automatically in two copies to two different disk units. Use of the duplicate file (transactions can be done in both files) makes the system secure, because in the event of disk failure the system is still operable with one of the copies.

The database manager provides management of a maximum of 255 multivolume files, each of which can contain a maximum of 15 million records.

The transaction management part of the communications subsystem also relies on the database management subsystem; it uses the database to store data on the dynamic links between the terminal network and the user "tasks". This makes it possible for the system to direct messages arriving from the terminals to the appropriate "task" and to execute transactions containing several dialogs in the appropriate order.

Hardware Architecture

Operating the TRACCS-11 program system described above requires a TPA-1148 or TPA-11/440 megamini computer with 0.5-1 M bytes of operational memory, depending on the parameters of the task to be solved, and 40-400 M bytes of magnetic disk background storage. In addition the central unit is usually supplemented by two magnetic tape units for archiving and transaction posting,

by one or two line printers and a few local display units for tasks outside of the online transaction processing (program development, batch processing, etc.).

The TRACCS-11 program system maintains communications with the transaction terminals according to the IBM 3270 BSC data transmission procedure, thus one can connect, as a transaction terminal, any terminal, display concentrator or computer which realizes the above protocol.

The terminals can be at any distance from the central unit, by using modems, and it is permitted to connect several displays or display groups to one line (multidrop configuration) (Figure 2).

The transaction processing system can also be part of a larger computer network. With online connection to a large (ESZR or IBM) computer center the TRACCS-11 offers both batch and conversational remote data transmission possibilities. The batch transmission can take place according to the IBM 2780 algorithm; the interactive procedure makes it possible for the transaction terminals of TRACCS-11 to access the large computer database directly as IBM 3270 terminals.

The boundary conditions of transaction processing tasks can often be satisfied more efficiently with a multiprocessor architecture. One form of doing this is the loosely connected dual system outlined in Figure 3.

The system has double input magnetic disk units, data transmission multiplexers made to receive all lines on each computer and an electronic line coupling; the two central units are connected to each other via a high-speed channel. (The other units not shown in the figure--magnetic tape, printer, etc.--do not affect the basic services of the system.)

In the normal operational mode the databases and transaction terminals are divided up between the two computers, in such a way that the great majority of the transactions are directed to the database in their "own" computer. The terminals can access the database of the other computer via the computer-computer channel (Figure 4).

The two computers regularly inform one another about their status and in the event of an error signal or if the "alive" signal is not given for a definite time then the so-called damage mode starts up automatically. Then the operating computer connects all the lines to itself with the electronic line coupling, "takes over" the magnetic disk units of the faulty computer and starts up copies--with stored status data--of the stopped programs in addition to its own programs (Figure 5). Service to the entire network continues with one system; to the users the failure means only an increase in response times. After the error is corrected the return to normal operation is also automatic and done with program control.

The architecture described is suitable for the creation of practically non-stop operation transaction processing systems; within broad limits it can be transformed into one with more than two processors, in accordance with changing user needs and with the development of local networks.

Conclusions Pertaining to Performance

We can draw conclusions pertaining to the performance capability of the TRACCS-11 on the basis of the following train of thought. Since the TRACCS-11 system is a "message controlled" information system and since each transaction consists of a series of message exchanges initiated from the terminals, the performance capability can be put in terms of how the response time for each message exchange develops with an increase in the number of terminals.

Let us regard the complete TRACCS-11 system as one provider system to which a demand for service (one message exchange) arrives on an average of every ks. If the average time to service the demands is one ks or more the size of the queue waiting for service would grow infinitely large. If the average time to service the demands is less than one ks then the size of the average queue can be determined in accordance with probability and queing theory. The time spent in the system by the demand last in line (the m-th demand) is m times the average service time. Let us presume that a message exchange arrives from each terminal on an average of every 100 s (the messages are prepared offline). Taking a 50 terminal system as a base this means that the expected frequency of demands reaching the central TRACCS-11 system (demand density) is 0.5 demands/s.

The simplified formula determining the size of the queue is:

$$q=ns/(1-ns)$$

where n is the average demand density and s is the average service time (Figure 6).

We must take the average running time of the "task" necessary to handle one message exchange as the average service time, which now can vary between 0.5 and 1.9 seconds.

The average service time obtained in studies done jointly with the Financial Computer Technology Institute was 1.2 seconds, on a three level database of about 80 M bytes performing transactions which take varying amounts of time (query, change, add) on a TPA-1148 computer.

If we look at a system where, for example, the average service time is 1.5 seconds then the size of the queue developing on the basis of the formula would be q=3, that is the demand arriving last in line would spend 4.5 seconds in the system. To this value we must add the data transmission time (2,400 baud--about 2 seconds) and this would give a largest expected response time of 6.5-7 seconds.

The studies and measurements very largely confirmed the above described theoretical considerations. On the graph which can be seen in Figure 7 the response times to be expected in the system of the PSZTI [Financial Computer Technology Institute] are shown as a function of the number of terminals.

At the time of the measurement we estimated the average demand density at 0.76 demands per second, giving an average service time of 1.2 seconds.

It follows from all this that the increase in the number of terminals is application dependent, but its value can be determined well in advance, for a single terminal and a well defined mix of transactions used is enough to measure the average service time.

We must also turn to a discussion of the fact that the TRACCS-11 makes possible the parallel running of more then one service "task", which can decrease the service time.

The findings of the studies show that the degree of parallelism should be kept around 3-5 parallel tasks; at values higher than this the increase in the self administration time of DOS-RV has a negative influence on the advantages to be obtained from parallel running.

Autobiographic Notes

Agnes Szigeti: I graduated from the Electrical Engineering School of the Budapest Technical University in 1970. I obtained my degree in applied mathematics in 1977 at the Lorand Eotvos Science University. I dealt with system software development at Orion until 1976 and then, until 1979, at the PMSZK. At present I am a scientific colleague of the administration mechanization department of the KFKI [Central Physics Research Institute]. I have a son 7 years old. I fill my very little free time with reading and excursions.

Pal Karadi: I graduated from the Electrical Engineering School of the Budapest Technical University in 1967. Since then I have been working for the KFKI where I dealt first with hardware development and then with applications techniques for small computers. At present I am chief of the administration mechanization applications department.

BIBLIOGRAPHY

1. The TRACCS-11 System User's Handbook, KFKI.

2. Queing Theory II, Computer Applications (Kleinrock), Wiley and Sons, 1978.

3. TRACCS-11 Communication Network Performance Studies, PSZTI, March 1984; Supplement, PSZTI, November 1984 (Attila Lovasz, Ervin Angeli, Imre Szabo, Judit Orosz, Mrs Eva L. Kereszturi).

4. Evaluation of TRACCS-11 Bench Mark Measurements, KFKI, April 1985 (Agnes Szigeti).

5. Transaction Processing With Megamini Computers, MERES ES AUTOMATIKA, 1984, 32 (2) (Agnes Szigeti and Pal Karadi).

FIGURE CAPTIONS

1. p 24. Architecture of the TRACCS-11 system.

2. p 25. Block diagram of a transaction processing system based on a megamini.

3. p 25. Block diagram of a dual system.

4. p 26. Normal operating mode.

5. p 26. Damage operating mode.

6. p 26. Average expected queue length.

7. p 27. Expected response times.

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MULTILAYER CERAMIC ENCAPSULATING SYSTEMS

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[Article by Janos Bonifert and Istvan Deak: "The Future of Encapsulating Integrated Circuits; Multilayer Ceramic Capsule Systems"]

[Excerpts] The development of electronic technologies is closely interdependent with the development of microelectronic encapsulating technologies. One direction is the transformation of traditional synthetic capsules toward surface assembly. The other direction is the development of multilayer ceramic capsules (element bearing, matrix conducting capsules). Domestic manufacture can be expected beginning next year; this justifies our becoming acquainted with the structure and manufacture of these now.

The Significance of the New Encapsulating Technique

The technology described here represents progress in four large areas of microelectronics:

--Semiconductor elements of customary size can be seated with surface assembly; their hermetic capsules of small size (with reduced connection raster distances) are the element carriers.

--The hermetic capsules of LSI/VLSI circuits with very many connections are ceramic capsules with matrix connection systems the connection pins of which are placed in the nodal points of a square net with a raster distance of 2.54 mm.

--The expensive metal-glass capsules can be replaced with ceramic capsules prepared for hybrid circuits.

--The bases for highly complex circuit systems with many elements are multilayer ceramic modules. Here the carrier, conducting network and capsule functions cannot always be sharply distinguished.

With the new capsules one can obtain an assembly density much greater than has been customary thus far and the size of the equipment can be decreased very significantly.

The element carrier can count on the largest scale and fastest spread, considering that it is one of the pillars of the ever more popular surface assembly technology.

According to the plans experimental manufacture of multilayer ceramic capsule systems in Hungary will begin in 1987 at the Microelectronics Enterprise with a domestic development in a close development-manufacturing cooperation with the KOPORC [Electronic Parts and Technical Ceramics Enterprise]. At first--adapting to the domestic needs which will probably not change too quickly--it is expected that a large volume of DIL capsules will still be made; the more modern designs will gradually force these into the background.

Autobiographic Notes

Istvan Deak: I graduated from the Electrical Engineering School of the Budapest Technical University in 1978, in the communications engineering B section. Between 1978 and 1980 I participated in day engineering training at the electronics technology faculty of the Budapest Technical University as an engineer for the Communications Engineering Industry Research Institute. Since then I have been working at the Microelectronics Enterprise, the legal successor to the HIKI [Communications Engineering Industry Research Institute], as a developmental engineer. I deal primarily with design and manufacture of thick layer hybrid circuits. I am married. I spend my free time most happily with reading, listening to music, cooking or garden work.

Janos Bonifert: I graduated from the Electrical Engineering School of the Budapest Technical University in 1971. My first job was at the predecessor of the MEV [Microelectronics Enterprise], the HIKI. During the 14 years which have elapsed I have had contact with virtually every aspect of thick layer technology--thick layer screen printing, assembly of thin and thick layer multichip circuits and encapsulation. Later my theme was design development of hybrid circuits. At present I am dealing with development of the surface assembly program of the MEV. Outside of the job I spend all my time with my family. I have four children in general school who take care of the profitable spending of my free time. The family often goes on excursions to the mountains or beaches. I like to read.

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MICROELECTRONICS PLANT AT COMMUNICATIONS ENGINEERING COOPERATIVE

Budapest MAGYAR ELEKTRONIKA in Hungarian No 5, 1985 pp 50-51

[Article by Bela Laczko: "Microelectronics Plant at the Communications Engineering Cooperative"]

[Text] The plant was established to process wafers containing CMOS gate arrays. They form the metal network on the prefabricated wafers and break up the wafers, then come the assembly operations--seating elements, wiring and encapsulation.

The first operation is forming the metal conducting network. The conducting network can be formed on the wafers, already supplied with an aluminum layer, with the photoresist technology. The modern equipment of the HT [Communications Engineering Cooperative] is suitable for processing wafers with a diameter of 100 mm (first picture). Automatic equipment applies the photosensitive lacquer to the wafers. The patterns of the mask must be fitted to the patterns existing on the wafers with great precision; this operation is extraordinarily critical for metal gate CMOS circuits. The pattern is etched away from the aluminum layer with the traditional wet chemical method.

The metal network must be covered with a protective layer to prevent corrosion. In the CVD reactor (second picture) the wafers receive a coating of phosphor glass. The glass must be removed above the contact areas with the aid of the photoresist technology.

After sintering (heat treatment) of the metal network the circuits are theoretically finished. In order that bad elements should not be assembled into a capsule the wafer is gone over by an automatic pin meter (third picture) and the automatic LSI meter classifies the circuits. Bad elements are marked with paint and are sorted out after the wafers are broken up.

Element seating is the first operation of assembly into a capsule. In the case of ceramic capsules they use epoxy resin seating (fourth picture) and ultrasonic aluminum wiring (fifth picture). One can make highly reliable circuits with this technology. The assembly equipment of the HT is non-automatic, modern, manually operated equipment. Closing is the final operation of encapsulation. The ceramic cover of the capsule is fixed to the ceramic housing with glass with a low melting point.

Even heating and cooling are needed for good closing; a modern, continual operation stove (sixth picture) provides this. Rinsing with pure, dry nitrogen is important during closing; this is necessary to create a proper climate inside the capsule. After testing the finished circuits are stamped and packaged.

Production has started already in the plant. They have already made 15 operable types of the 30 circuits designed or being designed; series manufacture according to demand has started also. After preparing their circuits in principle, users interested in the procedure can look up the leader of the microelectronics plant, Bela David, and if they pay the developmental costs of about 400,000 forints they can get samples for testing within 4-6 months. Series manufacture also requires 4-6 months after acceptance of the samples.

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INTRODUCTION TO BIOELECTRONICS, BIOTICS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 5, 1985 pp 54-60

[Article by Jozsef Csorba: "What Will Follow Silicon, or An Introduction to Bioelectronics and Biotics"]

[Excerpt] A Final Word

Molecular electronics is clearly in the stage of pure basic research, the larger part in an abstract state. In actuality the entire subject is at the level of simple, low order molecular structures. Production connected with proteins has not yet shown a single reliable plant test.

According to reliable estimates practical results can be expected only around 2010-2020. According to an American research survey about 100 scientists and researchers are working in this area today, most of them in the United States.

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EAST EUROPE/MICROELECTRONICS

COMPORGAN DIRECTOR ON STATUS OF HUNGARIAN SOFTWARE MARKET

Budapest MAGYAR ELEKTRONIKA in Hungarian No 5, 1985 p 84

[Interview with Karoly Pogany, director of the Comporgan System House: "We Have One Question...."]

[Text] [Question] Knowing that you gladly deal with questions of information management and that after your first book "Introduction to the Economics of Computer Centers" you are preparing a second work on this subject, we really have just one brief, simple question: Is there a software market in Hungary?

[Answer] The question is not at all simple, not even if I say bluntly that in my opinion there is no software market in our country. There are market possibilities for the demand for computer technology applications is obviously strong, there are vendors and customers and in a certain sense software is a product like the others, and if it is sold it will be a commodity. But we do not exploit these possibilities.

We agree that software is a product, especially if what is involved is not a unique need, but rather national, general goals and interests. But it is also a product because it has production costs. If I want to sell it 25 times then the price derives from the quotient of the expenditures and the units sold, so one can see the economicalness, the good possibility, especially because this product does not deteriorate and is not damaged in shipment. But such a calculation is not a question of professional resolve.

First of all one can sense a strong resistance on the part of users in regard to general use software products; they would rather order custom-made programs, even if they are more expensive and more risky. The direct and indirect regulators do not help resolve the situation; the time for more general, and thus momentarily more expensive, products to pay for themselves is longer, years go by before the total cost of development comes back from multiple users and the undertaking becomes profitable, but the regulators will not tolerate this, nor will the workers from whose pockets I now take the money. It is not by chance that the software manufacturers try to present all their products as new ones. Today almost two thirds of the computer technology experts are working in small undertakings where there is not enough capital to develop and offer to customers off-the-shelf systems which can be put to work immediately. So they strengthen the incorrect antipathy of the users; it is in

their interest to work more slowly, and if the customer has a lump they don't operate on it but put a program on it. The lack of capital often causes headaches for the big manufacturers too so they are asking for bank credit--while bearing all the risk--but for the time being in vain. Let me mention a curious element in the regulators, perhaps worthy of a comic journal: if a vendor sells a program to a private customer, a dentist, teacher or journalist, then he can mop up the wholesale and retail profit margins--and why shouldn't he. This totals 25 percent! Obviously this is not a good marketing policy.

Even if all this were not true the inscrutable hardware import policy would represent a serious obstacle for designing software products which could be produced in large series. The manufacturers cannot prepare for changes in the device base, and this greatly increases their risk. I estimate that if we take the years 1975-1980 as 100 then the volume of our software manufacture has dropped to about 60.

Few among the computer technology experts are able to say what should be done. Probably the easiest things to manage are the economic regulators; surely the device base could be made more lucid with a more deliberate import policy, free of administrative restrictions and guided by well considered preferences. In addition we should start a deliberate development of software trade, for we have no such merchants here. Indeed, we must finally define the more important basic concepts (for example, how can the trade of a software firm be measured in kind?) and certainly we must determine if there is a Hungarian software market and if there is then what is it like and what does it want.

The purpose of the Software '86 program organized by the Comporgan System House is precisely to popularize general use software products and systems and to provide a framework for the meeting of users and manufacturers--otherwise a chance matter.

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PRELIMINARY EXPERIMENTS FOR FABRICATING GaAs BASED MONOLITHIC MICROWAVE IC'S

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 7, Jul 85 pp 198-199

[Article by Dr Bela Szentpali and Mrs Tibor Nemeth of the Technical Physics Research Institute and Dr Gyorgy Reiter and Tamas Kuhn of the Telecommunications Research Institute: "Preliminary Experiments for Realization of GaAs Based Monolithic Microwave Integrated Circuits", a talk given at the symposium Electronics Technology '85, Budapest, 16-19 April 1985. The first paragraph below is the Hungarian summary.]

[Text] GaAs is an especially suitable primary material for preparation of monolithic microwave circuits. In the course of the preliminary experiments we developed microstrip waveguide and resonator elements on semi-insulating crystals with methods similar to the technology for active GaAs based microwave devices. We determined the effective dielectric constant and loss of the material with measurements done on these sample circuits.

A monolithic microwave integrated circuit consists of active elements and microstrip passive circuit elements on the same semiconductor crystal. GaAs is an especially suitable primary material for the production of such circuits because:

--some microwave active semiconductor devices cannot be realized on an Si crystal (e.g., Gunn diodes and MESFET transistors);

--other active elements realized on GaAs have substantially better parameters than those realized on Si (e.g., Schottky diodes, varactors, etc.);

--there is a semi-insulating GaAs (specific resistance 10^7 ohm-cm) which acts like a small-loss dielectric.

Two main technological procedures exist for producing such circuits. One produces the semi-insulating GaAs crystal with proton bombardment (1). Naturally this method can only produce semi-insulating layers of about a micron which are delimited from one side by a semiconducting material with a conductivity a good bit smaller than the metals. For this reason the loss of such circuit elements is relatively great, for example the attenuation measured along the line is 17 dB/cm at a frequency of 10 GHz (2). At the same time this method is suitable for fabricating high speed VLSI circuits (3).

The other technological trend starts from a semi-insulating GaAs crystal wafer. The development of the active devices takes place on the islands of the semiconducting epitaxial layer grown on the substrate. The islands can be created by selective epitaxial growth or by selective etching or by a combination of the two procedures. The passive wave guide structures connecting the active elements are prepared by two-side metallizing of the semi-insulating crystal wafer--the customary thickness of which is about 300 microns. Thus this procedure results in a wave guide delimited by substantially thicker dielectric and metal conductors, the attenuation of which is also substantially smaller, 1-2 dB/cm at a frequency of 11 GHz (see Table 2). It is another advantage of this procedure that because of the thicker dielectric layer the width of the strip lines is also greater and thus the technological uncertainties (photolithography, precision of etching, etc.) have less influence on the characteristic impedence of the line sections. Naturally one cannot use this method to produce units of high complexity and element density; typically they are circuits containing 2-5 active elements.

Measurement Results

We performed the measurements on two samples prepared in two technologically different versions. For purposes of measurement we formed a through line on the GaAs substrate and we formed a resonator with the aid of gaps inserted into the through line.

The microstrip lines were made with CrAu metallizing in the case of one sample and with AuGe metallizing in the case of the other.

To perform the measurements we built the 12 x 12 mm GaAs wafers into a metal box one inch by one inch (Figure 1). Microstrip lines with 50 ohm characteristic impedance fabricated on the ceramic carrier connect the SMA terminals attached to the box to the ends of the line of the GaAs wafer. A thin gold filament establishes the contact at the junction. The differing thickness of the GaAs wafer, relative to the ceramic, made it necessary to use a conducting shim.

With the aid of a network analyser we picked up the input reflection of the through line, cut off with 50 ohm characteristic impedance, and the microstrip resonator and we picked up the insertion attenuation in a broad band, as a function of frequency. The input reflection curve belonging to the through line contains maximum and minimum positions in accordance with whether the reflections arising at the ends of the line on the GaAs substrate strengthen or weaken the effects of each other.

The first such maximum falls in the vicinity of 1.8 GHz. At this frequency the length of the line is exactly one quarter wave. The impedance belonging to the input reflection as measured here coincides with the 50 ohms transformed by the quarter wave line. Ignoring the effect of the incidental reactances arising at the junction of the microstrip lines of different widths on the GaAs and the ceramic--this is still permissible at a frequency of 1.8 GHz--one can calculate the Z_o characteristic impedance of the microstrip line formed on the GaAs substrate. Table 1 contains the values obtained in the case of the

two samples. One can also find here the attenuation of the GaAs substrate lines for the length unit at 1.8 GHz. We obtained these values from the insertion attenuation curve, after substracting the losses caused by the leads on the ceramic.

The resonator is formed by a microstrip line 0.235 mm wide and 4.3 mm long at each end of which a 24 micron gap provides the coupling (Figure 2).

We established the resonance frequency from the measured insertion attenuation curve; this frequency was 11 GHz. Knowing the f_o midband frequency, the B bandwidth of the 3 dB points and the A_o base attenuation shown at the f_o frequency we calculated the loaded Q and unloaded Q_o quality factors of the resonators with the aid of the following equations:

$$Q = \frac{f_o}{B} \, \text{num lg} \frac{A_o}{20}$$

$$Q_o = \frac{f_o}{B} \cdot \frac{\text{num lg} \frac{A_o}{20}}{\text{num lg} \frac{A_o}{20} - 1}$$

When establishing the A_o base attenuation we took into consideration the effect of losses which could be attributed to the connecting lines on the ceramics and the effect of the rather significant reflection attenuation.

Making use of the fact that at the f_o frequency the resonators are approximately half a wave long we determined the effective dielectric constant of the microstrip lines formed on the GaAs substrate at a frequency of 11 GHz.

Table 2 summarizes the results of the resonator measurements. The similar values of the loaded and unloaded quality factors figuring in the table can be attributed to the relatively loose connection.

Figure 1, the measurement mounting, shows the through line and ceramic (keyed from the top) and the resonator and the GaAs wafer (keyed from the bottom).

Figure 2, the GaAs wafer, gives the dimensions of the circuit.

Table 1.

Value	CrAu Metallization	AuGe Metallization
f	1.79 GHz	1.80 GHz
Z_o	42.2 ohm	42.4 ohm
alpha	0.62 dB/cm	0.53 dB/cm
$\sqrt{E_{eff}}$	3.49	3.47

Table 2.

Value	CrAu Metallization	AuGe Metallization
f_o	11.080 GHz	11.140 GHz
B_o	305 MHz	319 MHz
Attenuation	5.55 dB	5.24 dB
Q	68.82	63.86
Q_o	76.95	77.07
$\sqrt{E_{eff}}$	3.15	3.13
alpha*	1-2 dB/cm	

*Deduced value from measurement of through line.

BIBLIOGRAPHY

1. A. G. Foyt et al; Isolation of Junction Devices in GaAs Using Proton Bombardment, SOLID STATE ELECTRONICS, No 12, pp 209-214 (1969).

2. J. Frey; Hybrid and Monolithic MIcrowave Integrated Circuits, MICROWAVE INTEGRATED CIRCUITS, Artech House Inc., pp xvii-xxi (1975).

3. R. C. Eden et al; Integrated Circuits: The Case for Gallium Arsenide, IEEE SPECTRUM, pp 30-37 (December 1983).

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EFFECT OF DOPANT CONCENTRATION ON BREAKDOWN OF GaAs-CrAu SCHOTTKY CONTACTS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 7, Jul 85 pp 200-201

[Article by Zsolt Horvath, Imre Gyuro and Margit Sallay (Mrs Nemeth) of the Technical Physics Institute of the Hungarian Academy of Sciences: "Effect of Dopant Concentration on Breakdown Properties of GaAs-CrAu Schottky Contacts," a paper read at the symposium Electronic Technology '85, Budapest, 16-19 April 1985. The first paragraph is the Hungarian language summary.]

[Text] In the case of a number of applications areas the breakdown behavior of GaAs microwave diodes is one of the most important characteristics (e.g., IMPATT, varactors, etc.). In the course of our present work we studied the breakdown properties of GaAs-CrAu Schottky contacts as a function of the dopant concentration of homogeneously doped epitaxial active layers.

We grew the active layers on the n^+ GaAs substrates in a chloride transport vapor phase epitaxial reactor. We selected homogeneous dopant concentrations in the range $3*10^{14}$ to $3*10^{17}$ cm^{-3}, while the thickness of the corresponding epitaxial layers fell in the range 22-1 microns. We passivated the surface of the GaAs with a CVD SiO_2 layer. We vaporized the CrAu Schottky and back-side AuGe ohmmic contacts with resistance heating. We formed the diodes with chemical etching involving photolithography. Figure 1 shows the finished structure.

We performed the measurements with the aid of a PARC C-V plotter operating at 1 MHz recording the C-V and G-V curves one after another in the same sensitivity range. We defined as the breakdown voltage that voltage value at which the C-V and G-V curves crossed one another (see Figure 2). At this voltage the quality factor of the Schottky condenser is 2 pi at the measurement frequency. We studied 10 diodes on every wafer and the relative spread of the breakdown voltage values obtained was less than 10 percent.

We determined the dopant concentration of the epitaxial layers on every wafer partly from the $1/C^2$-V plot and partly with the aid of a Post Office Profile Plotter. The values determined by the two methods showed good agreement.

Results and Evaluation

Figure 3 shows the measured breakdown voltages as a function of dopant concentration. We have also shown the theoretical curves obtained by Sze and Gibbons for the avalanche type breakdown of one-sided steep GaAs p-n junctions. The parameter of the theoretical curves is the radius of curvature of the p-n junction at the edges.

In figures 4 and 5 respectively one can see the breakdown field strength values determined by taking into consideration the contact potential difference in the case of a flat junction and the depletion depths belonging to the breakdown. We have again given the theoretical curves of Sze and Gibbons.

The concentration dependence of the parameters defined is large; the breakdown voltage decreases from 89 V for a concentration of $3*10^{14}$ cm^{-3} to 4.1 V at a concentration of $2.6*10^{17}$ cm^{-3} while the breakdown field strength increases from $9.0*10^{4}$ V/cm to $6.25*10^{5}$ V/cm. The depletion depth decreases from 19.8 microns to 0.16 microns.

The obtained values of the breakdown parameters are a good bit smaller than the theoretical ones, and the concentration dependence can be divided into two parts. The boundary between the two parts is at about $(2-3)*10^{16}$ cm^{-3}.

The question justly arises whether the cause of the breakdown voltage values being a good bit smaller than the theoretical ones might not be sought in the definition of breakdown voltage or in the thinness of the epitaxial layers compared to the theoretical depletion depths which can be seen in Figure 5. The answer to both hypotheses is a definite negative. On wafers with three different concentrations we determined the voltage values belonging to the 10 micro A residual current according to the generally accepted definition (that is, the breakdown voltage is that voltage necessary to obtain a given value of the current flowing through) and these were greater than the breakdown voltage values defined by us by 10-20 percent. In addition, on the basis of the theoretical breakdown field strength values which can be seen in Figure 4, we determined what thickness the epitaxial layer would have to have in order for the breakdown at the measured voltage to take place at the theoretical field strength value (d_B). Table 1 shows, as a function of concentration, the values obtained in this way, the depletion depths belonging to the breakdown and the thickness of the epitaxial layers (d_e). It can be seen that the epitaxial thickness is greater than both the d_B and W_B values.

The character of the concentration dependence of the breakdown voltage permits the conclusion that the primary reason for the small values is not to be sought in the edge effect either. The parallelism of the experimental and theoretical curves below concentration values of $3*10^{16}$ cm^{-3} makes it probable that the chief mechanism is dopant concentration enhancement along crystal faults as a result of which channels of higher concentration determining the breakdown behavior can form across the epitaxial layer. In this range one can determine an enhancement of about 12-13 times from the distance of the two curves. The concentration dependence of the breakdown voltage above a

concentration of $3*10^{16}$ cm^{-3} can be explained by the fact that the magnitude of the concentration enhancement decreases at higher concentration values.

Naturally the deep layers can also play a role in the creation of the phenomenon, especially for smaller concentration values. The development of dressed structures and DLS and X-ray diffraction studies are under way in order to clarify the role of the several mechanisms.

Expression of Appreciation

We express our appreciation to Imre Mojzes, Karoly Somogyi, Bela Szentpali and Ivan Szep for their support, to Andras Nagy and Peter Tutto for valuable ideas and to Mrs Jozsef Bacsvany, Mrs Albert Csonka, Mrs Janos Foldesi, Mrs Laszlo Lovicska, Akos Nemcsics, Tibor Nemeth, Gyorgy Stubnya and Mrs Zoltan Szedlacsek for their aid in preparing the samples.

[Figures 1-5 and Table 1 contain only internationally used mathematical and scientific notations.]

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

NEW RESEARCH IN BIOLOGY AND CHEMISTRY PLANNED

Prague RUDE PRAVO in Czech 3 Feb 86 p 5

(Article by Vlastimil Barus, Vice-President of the Czechoslovak Academy of Sciences: To Give More Than To Take")

[Text] The proposed Main Guidelines for the economic and social development of the CSSR between 1986 and 1990 and the outlook up to the year 2000 do not leave any doubt what has to be done and what goals have to be attained during that time span. After its approval by the 17th Party Congress, this document will represent a permanent program of the build-up and progress of our socialist society in the future. The basic guidelines for social and economy policy of the CPCZ till the year 2000 count on a high share of science and technology, based broadly on the realizations of the tasks defined in the Comprehensive Program For R&D Progress in the CEMA member countries up to the year 2000.

To solve important tasks in the field of natural sciences and chemistry, a system of specialized scientific branches has been developed in the CZAS and the SAS. We are justified to expect that they will continue to create focal points of R&D progress and innovations (as stipulated in the Main Guidelines proposal) by concentrating their efforts and resources on three important comprehensive programs: the development of biotechnologies, fermentation and microbiological production and their utilization in the agriculture and food processing industrial complex; the development of new materials; more intensive exploitation of the domestic raw material base (especially renewable natural resources) and of secondary raw materials by more intensive use of no-waste technologies; the creation and protection of the environment and improved public health care.

When discussing these tasks, I would like to point out the strategic significance of developing important branches of science such as cellular and molecular biology, ecological biology, chemistry, agriculture and forestry sciences, medicine and pharmacology; their progress is a decisive factor for ensuring the targeted implementation of these comprehensive programs.

National interests and effectiveness are the basic criteria for the selection and solution of S&T development tasks and to fulfil this order, our basic research planning has to comply with them. The priority of the research tasks

is thus clearly indicated and their name matters less than their aims, purpose, planning and distribution system.

The prerequisite of the planning is to increase the number of scientific and technical personnel in the 8th 5-Year-Plan. We do not, however, understand this as an intension of expansion,but of intensification, resulting from the requirement to increase considerably the productivity of the entire scientific research developemt base. It is therefore considered important that the management system be induced to influence more strongly all the activities of the institutes; this means a deliberate creation of conditions conducive to the development of particular scientific branches, to create adequate personnel and material prerequisites, to orientate workshops towards attaining priority important S&T fields.

The decision making orientation of the institutes was during the past 5-year plan methodically influenced by a demanding assessment of their development conception. We intend to continue applying this method together with a critical evaluation of the plans and operations of the institutes, as well as of their initiative to ensure, by their scientific contribution, the fulfilment of the tasks stipulated in the proposal of the Main Guidelines for the economic and social development of the CSSR.

The fulfilling of the principal mission of science will enable us to ensure another nationwide demand--the realization of research results on all management levels. This means to strengthen the cooperation with production organizations, but, above all, a progressively more effective share of the CZAS and the SAS workshops in the fulfilment of national goal-oriented programs and scientific research programs. In other words, a close cooperation with the National Commission of S&T and Investment Development will enable us to purposefully create innovation resources and incentives, to stimulate their utilization and to rationalize the transfer and application of basic research results in the entire innovation cycle.

The basic prerequisites for the fulfilment of these principal objectives has already been created. It is, for instance, the structural and subject orientation of the programs of the National Plan of Basic Research, which, in natural sciences and chemistry cover the principal trends of economic and social development. In the past 5-year plan, very good experiences were made and excellent results achieved in the solving of goal-oriented programs of basis research. Such as, for example, the program of integrated protection of cultured plants, ecologic optimalization of rural management, ecologic optimalization in the Eastern Slovakian plain, controlled reproduction of farm animals and other programs, the results of which have already been partially realized. They will be fully exploited in the conception of the creation and protection of the environment and in the rational exploitation of natural resources; this was done in close cooperation with the Czechoslovak Academy of Agriculture, and integrated into the Unified Plan of Development of S&T in the agro-industrial complex.

The problem of responsible evaluation of the number, key objectives and results of the CZAS and SAS contractual obligations is closely related to the fulfilment of the plan for a higher level of realization and nationwide

evaluation of the scientific results. In natural sciences and chemistry, we will be able to follow up attentively the assessment of these contracts, from the point of view of application and introduction of innovations and real possibilities of the particular institutes and scientific branches. The number of contracts is less relevant than their results and actual public effectiveness. The extension of the network of scientific production units and associations, as well as their increase implementation base in the CZAS and the SAS, remains a permanent task. Here, it will be necessary to create more space, to stimulate this activity both personneland material-wise, in even closer cooperation with the universities.

According to its rules, science is always looking towards the future. The party and the society, in view of their vested interests in scientific expansion, may rightfully ask what science has done and what it contributed so far to the build-up of socialism in our country. The proposal of the Main Guidelines for economic and social development of the CSSR and the fulfilment of the ambitious goals they include, demands better achievements not only in the field of science and administration, but also responsible management of resources and personnel, better participation possibilities for creative young people; thus, the society shall receive more than give. Such requirements should correspond not only to the attitude, but primarily to the work results of all scientists and other workers of the CZAS and the SAS.

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